

DRAFT

ENVIRONMENTAL ASSESSMENT ESTABLISHMENT OF RESTRICTED AREA AIRSPACE 6604C/D/E AT WALLOPS FLIGHT FACILITY



July 2016

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337



Cover image: NASA Wallops Flight Facility P-3 aircraft – Photo Credit: James Mason-Foley, February 2009

Inset image: NASA Wallop Flight Facility Main Base airfield – Image Credit: Christopher Perry, September 2012

National Aeronautics and
Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337



Reply to Attn of: 250.W

July 1, 2016

Dear Reader:

This letter is to notify you, as a potentially interested stakeholder, of the availability of the Draft Environmental Assessment (DEA) for NASA's proposed expansion of the Restricted Area Airspace at Wallops Flight Facility (WFF), Wallops Island, Virginia.

Prepared in accordance with the National Environmental Policy Act (NEPA), the DEA evaluates the environmental consequences of expanding the Restricted Area Airspace directly above and adjacent to the WFF Main Base airfield by establishing new Restricted Area Airspaces R-6604C/D/E. In addition to the Proposed Action, the DEA evaluates the No Action Alternative.

This notice has been sent to you because public involvement is a very important part of the NEPA process. Should you desire, NASA respectfully requests that you review and provide written comments on the DEA by **August 1, 2016**.

An electronic version of the DEA is available on the project website at:
http://sites.wff.nasa.gov/code250/Establishment_R-6604CDE_DEA.html.

The DEA is also available for review at the Eastern Shore Public Library, Accomac, Virginia; the Chincoteague Island Library, Chincoteague Island, Virginia; and the NASA WFF Visitor's Center, Wallops Island, Virginia. A limited number of hard copies of the DEA are available on a first request basis.

Please direct all questions, requests for copies, and comments on the DEA to one of the following:

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Wallops Island, VA 23337

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Thank you for your interest in this project. We look forward to hearing from you.

Sincerely,
A handwritten signature in black ink, appearing to read "Theodore J. Meyer".

Theodore J. Meyer
Associate Chief, Medical and Environmental Management Division

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**DRAFT ENVIRONMENTAL ASSESSMENT
ESTABLISHMENT OF RESTRICTED AREA AIRSPACE R-6604C/D/E
AT WALLOPS FLIGHT FACILITY**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA 23337**

Lead Agency: National Aeronautics and Space Administration

Cooperating Agency: Federal Aviation Administration
Air Traffic Organization

Proposed Action: Establishment of Restricted Area Airspace R-6604C/D/E
at Wallops Flight Facility

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ABSTRACT

This Environmental Assessment (EA) addresses the proposed establishment of Restricted Area Airspace (R-) at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF), located in Accomack County, Virginia. Under the Proposed Action, NASA would request the Federal Aviation Administration grant additional Restricted Area Airspace such that NASA can conduct experimental test profiles with a much lower risk of encountering non-participating aircraft. No changes are proposed to the types of aircraft or types and number of operations conducted within the airspace adjacent to WFF. The new Restricted Area Airspace would supplement WFF's existing R-6604A/B airspace.

This EA analyzes the potential direct, indirect, and cumulative environmental effects of two alternatives: the Proposed Action and the No Action Alternative.

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Acronym	Meaning
AAOC	Administrative Agreement on Consent
AGL	Above Ground Level
ANSI	American National Standards Institute
AOC	Areas of Concern
ARTCC	Air Route Traffic Control Center
ASO	Aviation Safety Office
ATC	Air Traffic Control
ATO	Air Traffic Office
BASH	Bird Animal Strike Hazard
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
CAA	Clean Air Act
CEA	cumulative effect analysis
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNWR	Chincoteague National Wildlife Refuge
COA	Certificate of Authorization
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DEQ	Department of Environmental Quality
DNL	Day Night Average Sound Level
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
ELV	Expendable Launch Vehicle
EPA	Environmental Protection Agency
ERD	Environmental Resource Document
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FCLP	Fleet Carrier Landing Program
FICUN	Federal Interagency Committee on Urban Noise

Acronym	Meaning
FR	Federal Register
ft	feet
GPR	Goddard Procedural Requirement
GPS	Global Positioning System
IEEE	Institute of Electrical and Electronics Engineers
IFR	Instrumented Flight Rules
JLUS	Joint Land Use Study
KIAS	Knots-Indicated Air Speed
km	kilometer
kPa	kilopascal
L _{Amax}	Maximum A-weighted Sound Level
L _{max}	Maximum Unweighted Sound Level
m	meter
MBTA	Migratory Bird Treaty Act
MEA	Minimum Enroute Altitude
mi	mile
mph	miles per hour
MSL	Mean Sea Level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NPR	NASA Procedural Requirements
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
OSHA	Occupational Safety and Health Administration
PDARS	Performance Data Analysis and Reporting System
psf	pounds per square foot
R-	Restricted Area Airspace

Acronym	Meaning
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SR	Slow Route
SUA	Special Use Airspace
UAS	Unmanned Aircraft System
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USN	U.S. Navy
V-	Victor Airway
VACAPES	Virginia Capes Operating Area
VDCR	Virginia Department of Conservation and Recreation
VFR	Visual Flight Rule
VOR/DME	Very High Frequency [VHF] Omnidirectional Range and Distance Measuring Equipment
VPDES	Virginia Pollutant Discharge Elimination System
VR	Visual Route
W-	Warning Area
WFF	Wallops Flight Facility
WRP	Wallops Research Park

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1 Introduction and Purpose and Need for Action

1.1 Regulatory Compliance

The National Aeronautics and Space Administration (NASA) has prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts of the establishment of additional Restricted Area Airspace in the vicinity of Wallops Flight Facility (WFF), Accomack County, Virginia. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA), as amended (Title 42 of the United States Code [U.S.C.] 4321–4347), the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] 1500–1508), NASA’s regulations for implementing NEPA (14 CFR Subpart 1216.3), and the *NASA NEPA Management Requirements* (NASA Procedural Requirement [NPR] 8580.1A).

1.2 Cooperating Agency

NASA, as the WFF property owner that manages the Wallops airfield and the operations that are conducted from it, is the Lead Agency in preparing this EA. The U.S. Department of Transportation’s (DOT) Federal Aviation Administration (FAA) Air Traffic Organization (ATO) has served as a Cooperating Agency because it possesses both regulatory authority and specialized expertise regarding the Proposed Action.

The FAA regulates U.S. airspace in accordance with the authorities granted to it under 49 U.S.C. Subtitle VII, Part A, Subpart I, Chapter 401, § 40103. All entities, including agencies of the U.S. government such as NASA, must submit a request to FAA for it to grant changes to the nation’s airspace. Furthermore, as a Federal agency, FAA has its own agency-specific NEPA obligations (outlined in FAA Order 1050.1F) with which it must comply prior to approving an airspace action.

Chapter 32 of FAA Order JO 7400.2K establishes the requirement for cooperation between FAA and non-Department of Defense Federal agencies requesting changes to Special Use Airspace (SUA). Per the referenced order, the Federal requesting agency (in this case, NASA) assumes the role of Lead Agency with FAA serving as a Cooperating Agency. As a Cooperating Agency, FAA will independently review the environmental documents prepared by NASA and assess whether they meet the agency’s standards for adequacy under NEPA. If FAA determines that this EA meets its standards, it will either adopt the document in whole or in part to fulfill its NEPA obligations for the proposed airspace action.

1.3 Purpose and Need for the Proposed Action

1.3.1 Purpose

The National Aeronautics and Space Act (Pub. L. No. 111-314, 124 Stat. 3328, December 18th, 2010) provides U.S. Congressional authority to conduct operations that contribute materially to, “the expansion of human knowledge of the Earth and of phenomena in the atmosphere and space.”

It also provides for “the improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles.” In keeping with these congressionally mandated goals, WFF conducts a variety of elevated risk test activities whose operations center around the airfield’s unprotected portions of airspace. Additionally, inter-governmental agreements, such as those with Naval Air Station Patuxent River and Naval Air Systems Command, leverage NASA’s capability at WFF for operational and developmental test and evaluations of military systems in support of our nation’s defense and security.

The purpose of NASA’s request for additional Restricted Area Airspace is to protect non-participating aircraft from the dangers associated with high-risk experimental test flight operations by expanding the existing airspace in a segmented fashion, thereby facilitating safe separation between the two in a minimally impactful approach to current civil air traffic.

1.3.2 Need

WFF currently provides NASA, tenants and commercial customers with pads for rocket launches and runways for aircraft operations. Rocket launches are supported by the existing range and is not included in the scope of this EA. There is no change in aircraft operations. The scope of this EA is focused on simply extending the Restricted Area Airspace to protect existing operations and non-participating aircraft.

Presently, the majority of high-risk test profiles conducted at WFF are only partially contained within established Restricted Area Airspace (commonly denoted as R- followed by an assigned number, e.g., R-6604). These activities present a substantial hazard to civil air traffic in the vicinity of WFF. Aircraft owned and operated by NASA at WFF include heavily modified variants of the following (not an all-inclusive list): the P-3 Orion, T-38 Talon, WB-57 Canberra, ER(U)-2 Dragon Lady, C-23 Sherpa, T-34C Turbo Mentor, BE-20 King Air, UH-1 Huey, RQ-4 Global Hawk, and several smaller unmanned systems such as the RQ-2 Pioneer and Viking 400. Additionally, multiple Department of Defense (DOD) aircraft such as the E-2C Hawkeye, E-2D Advanced Hawkeye, C-2A Greyhound, P-8 Poseidon, X-47B, F-35 Joint Strike Force, KC-130 or NC-130H Hercules, F/A-18 Hornet, as well as commercial aircraft, utilize WFF to conduct experimental test profiles. Expanding the existing airspace is needed to safely segregate civilian air traffic from the flight testing of unproven and experimental aerial systems, including unmanned and launched vehicle systems, as well as pilot training.

1.3.2.1 Limited Maneuverability

Test aircraft are often heavily modified to test new systems. These modifications can restrict the pilot’s ability to maneuver the aircraft. An unplanned, abrupt maneuver (possibly caused by intruding non-participating air traffic) violates the “build-up” safety principal of flight test. Such an event could exceed a design limit load, place the aircraft in untested/unproven energy state (e.g., structural stress), and endanger both the test aircrew/aircraft as well as non-participating (e.g., civil) air traffic. The limited maneuverability of aircraft used to implement tests during flight

test presents an unusual hazard to non-participating aircraft, and inherently increases the risk of a midair collision when tests are conducted in co-use airspace.

Pitot-static testing involves systems that gives static and dynamic pressure to aircraft avionics including the altimeter, airspeed indicator and the vertical speed indicator. Testing these systems presents another unusual risk to non-participating aircraft. NASA is a self-certifying agency (i.e., per FAA regulations, NASA tests and certifies pitot-static systems for airworthiness) that routinely alters and/or develops alternative pitot-static system infrastructure. In order to validate engineering analysis, these new systems require ‘truthing’ by using static sources (e.g., field testing software using aircraft). The tower fly-by method is used to measure static source error by conducting a series of stabilized low-altitude passes. This requires a lengthy testing time. At times, these passes are executed at high subsonic speeds in a multitude of configurations. Non-participating aircraft may not be able to “see-and-avoid” fast enough to avoid a mid-air collision. Participating aircraft, by the nature of such testing, are placed in sub-optimum conditions to see and react to air traffic intrusions. In addition, air data testing often requires aircraft to exceed the 250 Knots-Indicated Air Speed (KIAS) (288 miles per hour [mph]) restriction below 3,050 meters (m) (10,000 feet [ft]) within the national air space. Accordingly, as a risk mitigation measure, test airspace must have exclusive use and non-participating aircraft must remain clear of the area.

1.3.2.2 Operation of Potentially Hazardous Systems

NASA WFF conducts a variety of in-flight system tests that present unusual hazards and require clear airspace. The instrumentation, sensors, and equipment installed on modified aircraft must undergo formal airworthiness flight testing and evaluation. Some of the systems NASA tests are emitters that have the potential to induce harmful electromagnetic interference effects with non-participating aircraft. Since unusual electromagnetic emissions from aircraft being tested could pose a threat to flight critical equipment on non-participating aircraft in the designated test area, flight clearance limitations of both NASA and DOD aircraft often require clear or sterilized airspace. Additionally, NASA performs laser firings / calibrations of equipment that could cause severe or permanent eye damage if a non-participating aircraft accidentally intrudes within the safe hazard distance of such tests.

1.3.2.3 Unconventional Testing

Finally, similar to electromagnetic compatibility testing, NASA conducts a variety of non-traditional and unconventional tests at WFF that present additional unusual hazards to non-participating aircraft. Such tests include instrumentation separation testing, the launch of tethered aerostats at significant altitudes for long durations, captive carry tests of external sensors or instruments, and horizontally launched expendable launch vehicles including emergency and nominal return-to-base profiles for unmanned (and future potential for manned) space flights. The proposed expansion of NASA WFF’s Restricted Area Airspace, R-6604A/B, is a risk mitigation measure to contain these hazards.

In accordance with 49 U.S.C. 40102 and FAA Advisory Circular 00.1-1A, NASA must perform these tests as part of its airworthiness certification process for public aircraft. Although this testing has been performed within existing airspace in the past, the increasing frequency of “close calls” with civil air traffic and the continued growth of the surrounding area present an unacceptable hazard to all parties involved, including individuals on the land underneath the designated test areas.

1.3.3 Cooperating Agency Purpose and Need

The purpose of FAA's Proposed Action is to respond to NASA's request for the designation of additional Restricted Area Airspace in the vicinity of WFF.

The need for FAA's Proposed Action results from the agency's statutory direction to ensure both the safety of aircraft and the efficient use of airspace. As such, when the agency deems it to be in the public interest, FAA may modify airspace assignments such as that proposed herein. FAA has initiated this process with their notice in the Federal Register regarding the proposed expansion of Restricted Area Airspace 6604 (see **Section 2.3.2** below for details).

1.4 Related Environmental Documentation

Existing NEPA and environmental resource documents were used as the basis for presenting the current operations and existing conditions as described in this EA. The following NEPA documents were prepared for actions at NASA WFF and are incorporated by reference into this EA:

- 2005 NASA WFF Site-Wide EA/Finding of No Significant Impact (**NASA, 2005**). (Preparers have carefully reviewed this document as it relates to the Proposed Action and determined that it is still accurate.)
- 2008 EA/Finding of No Significant Impact for the Wallops Research Park (**NASA, 2008**).
- 2013 EA/Finding of No Significant Impact for E-2/C-2 Field Carrier Landing Practice Operations (FCLP) at Emporia-Greenville Regional Airport, Greenville County, Virginia, and NASA WFF (**USN, 2013**).
- 2016 WFF Environmental Resources Document (ERD) (**NASA, 2016**).

2 Proposed Action and Alternatives

2.1 Introduction

This Chapter provides a discussion of the alternatives under consideration for expansion of Restricted Area Airspace at WFF. The No Action Alternative and the Proposed Action are evaluated in this EA.

2.1.1 Aspects Common to Proposed Action and No Action Alternative

The Proposed Action and No Action Alternative share many of the same operational components. As such, they are presented once in this Section instead of repeating the discussion under each Alternative.

2.1.1.1 Airfield Operations

NASA operates three runways at the WFF Main Base. Runway 10-28, which is the primary use runway; Runway 04-22, which is used for friction testing and touch-and-go tests; and Runway 17-35, which is an infrequently used crosswind runway. The airfield is used by NASA, NASA's partners and customers, and the DOD to conduct real time tests in support of aeronautical research activities and pilot proficiency training. WFF's airport infrastructure provides communications, telemetry, radar tracking, and flight path guidance, as well as refueling and maintenance facilities for various types of aircraft. Typical support components of the airfield include hangars, fueling systems, security, tracking systems, and an operations control tower. The airfield is also used as an emergency divert field for aircraft (commercial, private, and military) experiencing difficulties in flight.

The WFF aircraft fleet is operated, maintained, and managed by qualified flight crews and personnel with the goal of providing efficient and safe airborne operations. The maintenance and operation of the aircraft are the responsibility of the Aircraft Office, Code 830. WFF piloted aircraft operations can include employee transportation, payload delivery, rocket launching platforms, range surveillance, and inflight scientific experiments. Science mission aircraft are modified and upgraded, as needed, for mission requirements. Many of these same activities are performed by NASA customers. NASA-owned aircraft operating at WFF include the following (not an all-inclusive list): 4-engine turboprop, heavy lift P-3 Orion and C-130 Hercules aircraft; 2-engine turboprop 30-passenger C-23 Sherpa aircraft; the high-altitude ER(U)-2 Dragon Lady; and Unmanned Aircraft System (UAS) such as the RQ-4 Global Hawk, the RQ-2 Pioneer, and the Viking 400 which support science missions; single turboshaft engine, two-bladed main rotor and tail rotor, UH-1 Huey helicopter to support science missions and range surveillance; a single engine turboprop T-34 Turbo Mentor aircraft for UAS chase and pilot proficiency training; and a 2-engine turboprop, 9-passenger Beechcraft-200 KingAir aircraft to support range surveillance and employee transportation on agency missions.

Many of the airfield operations (i.e., flights) conducted at WFF include military pilot proficiency training that consists primarily of touch-and-go exercises in which the aircraft wheels touch down on the airstrip but the aircraft does not come to a complete stop. The Air Force, Air National Guard, Army, U.S. Coast Guard (USCG), and the U.S. Navy all conduct pilot proficiency training at WFF runways. Aircraft involved in touch-and-go and other flight exercises at WFF may include, but are not limited, to E2/C2 turbo props, A-10, C-12, C-40, F-15, F-16, F-18, F-22, and F-35.

An airfield operation represents the single movement or individual portion of a flight in the WFF airfield airspace environment such as one takeoff, one landing, or one transit of the airport traffic area. The baseline airfield operation level for WFF of 12,843 was established in 2004 using annual airfield operations data for that year with an envelope that included a 25 percent increase above the total (**NASA, 2005**). In 2013, the baseline airfield operation level was again increased to include an additional 45,000 annual U.S. Navy E-2/C-2 Field Carrier Landing Practice operations (**USN, 2013**). Therefore, a grand total of up to approximately 61,000 flight operations could occur at the WFF airfield in a given year.

2.1.1.2 Airspace

The WFF airfield airspace environment is comprised of FAA designated Class “D” airspace. Class D airspace generally surrounds airports with an operations control tower. Class D airspace for NASA is above the WFF runways extending from surface to 750 m (2,500 ft) mean sea level (MSL) in an 8 kilometer (km) (5 mile [mi]) radius of the airport. R-6604A/B is NASA controlled/Restricted Area Airspace that overlies all of Wallops Island, the majority of the Mainland, and a portion of the Main Base runways (refer to **Figure 2-1**). R-6604A/B also connects to the Navy’s offshore Fleet Area Control and Surveillance Facility, Virginia Capes Operating Area (FACSFAC VACAPES) managed W-386. R-6604A/B is available 24 hours a day, 7 days a week from the surface to unlimited altitude, while W-386 is from the surface to unlimited altitude with hours of use being intermittent. Notices-to-Airmen (NOTAMs) are issued when these areas are activated. When not in use, R-6604A/B and W-386 are “cold” and the airspace is returned to the National Airspace System (NAS).

The northwestern portion of R-6604A/B presents some ambiguity since this portion overlies, approximately, the southeast portion of the WFF airport air traffic area. Normally, the WFF control tower is the focal point of control for all air traffic transiting that portion of R-6604A/B extending into the airport air traffic area. However, the point of control for this northwest portion is relinquished to the WFF Range Test Director by the control tower operator, when test range operations dictate a need. Non-participating aircraft must contact the WFF Range Control Center or the Washington Air Route Traffic Control Center (ARTCC) to obtain clearance to transit through any portion of the restricted area. When not activated, the Restricted Area Airspace is made available to general aviation and commercial air traffic.

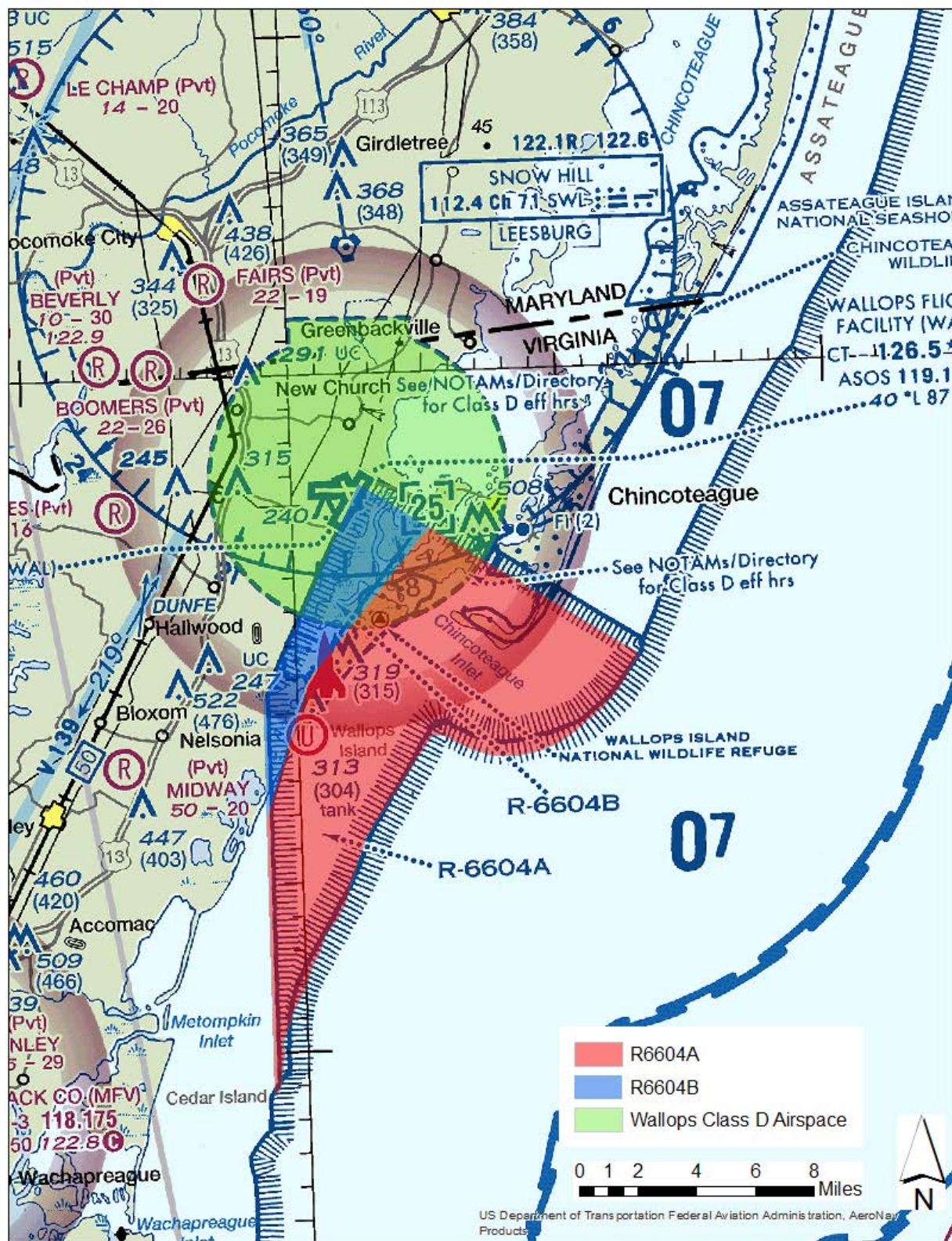


Figure 2-1: WFF Restricted Area R6604A/B and Class D Airspaces

2.1.1.3 Aviation Safety

In addition to complying with all applicable FAA aviation safety guidance, WFF has an established Aviation Safety Program that must be followed during all piloted aircraft and UAS operations. Defined in Goddard Procedural Requirement (GPR) 8715.2, *Aviation Safety Program*, the program is overseen by an Aviation Safety Council and coordinated by an on-site Aviation Safety Officer. Key program elements include aircraft safety training, education, and awareness; hazard and mishap reporting and investigation; and airworthiness reviews prior to changes in aircraft design or configuration.

Another important component of aviation safety at WFF is its ongoing wildlife hazard management program, sometimes referred to as the Bird/Wildlife Aircraft Safety Hazard (BASH) program. Performed on NASA's behalf by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service's Wildlife Services Division, the purpose of the program is to mitigate both short- and long-term hazards to aviation. Since the development of WFF's Wildlife Hazard Management Plan in 2001, USDA has maintained a full-time presence at WFF to disperse and remove birds and mammals from the airfield. Program objectives include reducing the attractiveness of WFF to birds and wildlife by minimizing food sources, nesting sites, and roosting habitat within the airfield clear zones. USDA personnel regularly implement various management techniques within and adjacent to the WFF airfield, which can include: identifying and manipulating species habitat and roosts, employing techniques to disperse species, and, if deemed necessary, removal of birds and/or mammals that pose a hazard to human health and aviation safety under appropriate Federal and state permits.

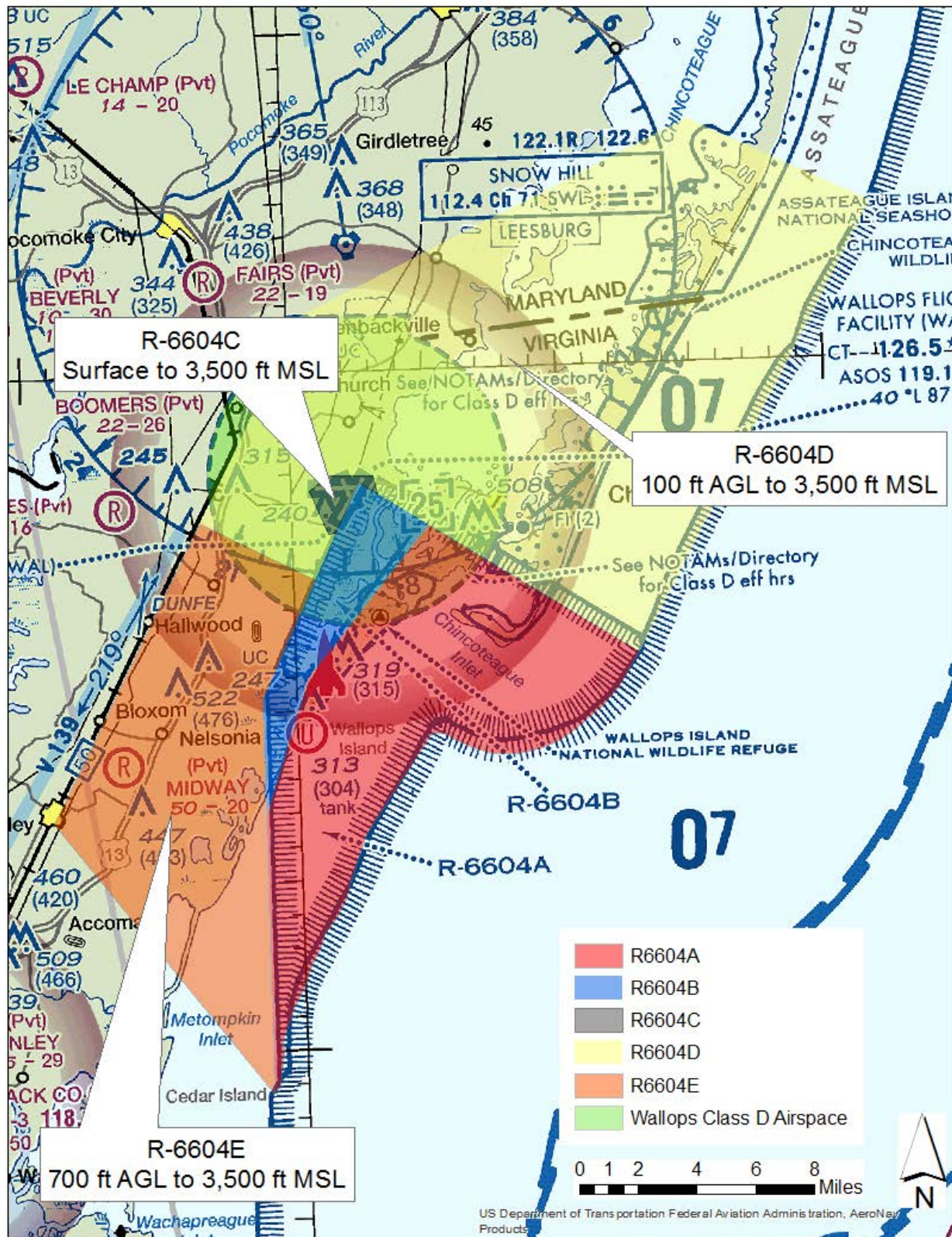
2.2 No Action Alternative

CEQ's NEPA implementing regulations require that an agency "include the alternative of no action" as one of the alternatives it considers (40 CFR 1502.14[d]). The No Action Alternative serves as a baseline against which the impacts of the Proposed Action are compared. Under the No Action Alternative for this EA, FAA would not grant the airspace change that NASA has requested. In either instance, aircraft operations at WFF would continue at the same tempo within the Class D airspace, R-6604A/B, and offshore Warning Areas controlled by the FACSFA VACAPES. The NEPA analyses referenced in **Section 1.4** above, form the baseline for the No Action Alternative.

2.3 Proposed Action

2.3.1 NASA

With the purpose of safely segregating civil air traffic from flight testing of unproven and experimental aerial systems, NASA has applied to FAA for the expansion of R-6604 by adding new airspace designated R-6604C/D/E (**Figure 2-2**). R-6604C would incorporate the airspace from the ground surface up to, and including, 1,065 m (3,500 ft) above ground level (AGL); would be linked to



Note ft: feet; AGL: above ground level; MSL: mean sea level

Figure 2-2: Proposed Restricted Area Airspace R-6604C/D/E

R-6604A/B; and would extend through and beyond the Class D airspace. Similarly, R-6604D would extend from 30 m (100 ft) AGL to 1,065 m (3,500 ft) AGL; whereas, R-6604E would span from 213 m (700 ft) AGL to 1,065 m (3,500 ft) AGL. Similar to existing R-6604A/B, each section of airspace could be activated separately, as needed. Activation of these areas would be accomplished by issuing a NOTAM at least 12 hours prior to the activation.

NASA and its partners' aircraft are currently operating in the airspace proposed for expansion but the risks associated with experimental flight testing at WFF can neither be mitigated by the existing Restricted Area Airspace nor contained within the Class D airspace surrounding the WFF airfield. Therefore, this expansion is considered a risk mitigation measure that would help protect general aviation and civilian aircraft from unavoidable hazards associated with experimental flight tests. This proposal would formally designate the operating airspace as restricted, thereby, permitting NASA to close the airspace to non-participating aircraft when in use.

The geometry of the proposed Restricted Area Airspace expansion is based upon the minimums for visual flight rules (VFR)¹, cloud clearances, and terminal area performance of the typical unproven and experimental aircraft profiles to be flown. Expansion would not involve changes in the current WFF approach patterns, glide slopes, or landing patterns. The floor and ceiling altitudes [215 m (700 ft) AGL up to, and including, 1,065 m (3,500 ft) AGL] represented the minimums required to accomplish the necessary test maneuvers associated with the flight events. Linked to R-6604A/B, and extending through the WFF Main Base Class D airspace, the expansion of the Restricted Area Airspace would fully cover the WFF airfield and would encompass the airspace in which high-risk operations originating from the airfield are currently conducted.

While attempting to provide safe separation of experimental flight tests from the flying public, NASA recognizes the need for general aviation to remain overland when conducting flight operations. Therefore, in order to ensure the continued over land flight of civilian aircraft when R-6604C/D/E is activated, the proposed Restricted Area Airspace would not extend further west than the existing WFF Class D Airspace. This would provide civilian air traffic an overland north-south route along Virginia and Maryland's Eastern Shores. When the airspace restriction is not activated, the airspace included within R-6604A/B and the proposed addition of R-6604C/D/E would be made available to general aviation and commercial aircraft. Additionally, NASA would activate only that portion of the Restricted Area Airspace that would be required for a specific flight profile and relinquish the remaining Restricted Area Airspace to the NAS. This is consistent with NASA's current practice for R-6604A/B.

The annual airfield operations at WFF in 2015 totaled 41,786 (**Ferrier, 2016**). The maximum baseline of annual airfield operations at WFF is approximately 61,000 (**USN, 2013**). Neither the types of aircraft hosted at WFF nor their operational tempo would change with the proposed

¹ Visual Flight Rules - rules that govern the procedures for conducting flight under visual conditions.

expanded range (R-6604C/D/E). **Table 2-1** lists the forecasted activation of each of the airspace areas.

Table 2-1: Comparison of Restricted Area Airspace Use

Alternative	Special Use Airspace	Average Daily Use Duration (hours)	Average Days Per Year	Average Annual Usage (hours)
No Action	R-6604A	12	269	3,320
	R-6604B	11	240	2,642
Proposed Action	R-6604C	1.5	120	180
	R-6604D	1.5	120	180
	R-6604E	1.5	40	60

2.3.2 FAA

In response to NASA’s request for the expansion of Restricted Area Airspace, FAA considered the merits of NASA’s proposal per its 14 CFR Part 73 rulemaking process and subsequently published a notice of proposed rulemaking for the “Proposed Amendment and Establishment of Restricted Areas; Chincoteague Inlet, VA” in the *Federal Register* (80 FR 54444). FAA invited public comments on the proposal from September 10, 2015, through October 26, 2015 and received eleven comments during that period (Appendix A). On January 21, 2016, the FAA announced in 81 FR 3353 the reopening of the public comment period until February 22, 2016. Two additional comments were received during this period (Appendix A). This EA incorporates responses to the public comments. Upon consideration of the comments, FAA would decide whether to approve or deny NASA’s request. However, the agency cannot make a final decision on any particular SUA proposal prior to the completion of both the environmental and the aeronautical review processes. Therefore, FAA would not issue its final rule on the proposed airspace action until it has met its NEPA obligations (intended through the FAA’s adoption of this NEPA document) and any proposed changes have cleared the FAA aeronautical review process.

If FAA grants NASA’s request, the new Restricted Area Airspace would be charted on applicable instrument approach procedures. The proposed Restricted Area Airspace comes very close to numerous final approach courses of surrounding airports so increasing pilot situational awareness is important. Providing for visual flight rules (VFR)² stand-alone waypoints in the Chincoteague area will assist pilots unfamiliar with the area to safely navigate around any expansion of the Restricted Area Airspace.

2.4 Alternatives Eliminated from Further Consideration

2.4.1 Different Type of SUA Designation

NASA and FAA are not considering designating the airspace under another type of SUA (e.g., Warning Area or Alert Area) as neither of these designations would restrict civil aircraft from

² Visual Flight Rules - rules that govern the procedures for conducting flight under visual conditions.

entering the airspace. At-will entrance of civil aircraft could create a hazard to test aircraft and personnel, civilian aircraft and operators, the public, and civil and government infrastructure on the ground. This risk is in direct opposition to the purpose of the proposed action.

2.4.2 Different Geometry

The proposed Restricted Area Airspace has been vetted numerous times with local stakeholders and FAA and has been reduced in size when compared to the initial request (**Figure 2-3**). Under instrument flight rules (IFR)³, aircraft must utilize specific flight approaches and navigational aids when landing at airports. The area navigation approach path for Accomack County Airport Runway 21 would run down the western edge of R-6604D/E, northeast of the airport. Furthermore, the radio navigation station (VHF omnidirectional range [VOR] and distance measuring equipment [DME] or VOR/DME-A) approach for Crisfield Municipal Airport and the instrument landing system Runway 32 at Salisbury-Ocean City Regional both use the Snow Hill navigational aid for an initial approach fix at 610 m (2,000 ft) along V-139, which would coincide with the originally proposed western edge of R-6604C (**Figure 2-3**). Although, aircraft operating under VFR in visual meteorological conditions are not required to use the navigational aid or the 610 m (2,000 ft) flight path along V-139, aircraft operating in IFR require this navigation aid. Therefore, based upon discussions with the local controlling agencies, NASA removed the northwestern corner of the airspace in order to minimize the impact to existing approaches into Salisbury, Maryland and Ocean City, Maryland regional airports.

NASA also considered the possibility of maintaining a 1.4 km (0.75 nautical miles [nm]) separation from the centerline of V-139 along the entire western border of the requested expansion of the Restricted Area Airspace. However, this would risk the utilization of WFF Runway 10-28 for test points such as high-speed tower flybys for pitot static calibration, as well as restricting departures from Runway 28 of unproven or experimental aircraft by potentially creating a hazard to test aircraft and personnel, civilian aircraft and operators, the public, and civil and government infrastructure on the ground. This risk is in direct opposition to the purpose of the proposed action.

Finally, the initial proposal of R-6604C consisted of a single block of airspace from 213 to 1,065 m (700 to 3,500 ft) AGL. To further mitigate impacts to general aviation, the airspace was divided into three smaller blocks such that only the airspace needed for testing could be activated, at any given time (refer to **Table 2-1** for forecasted hours of operation for each airspace area). The requested, tailored airspace as currently proposed is depicted in **Figure 2-2**. NASA believes that this solution will minimize the impact to civil aviation on the Delmarva Peninsula.

³ Instrument Flight Rules - a set of rules governing the conduct of flight under instrument meteorological conditions.

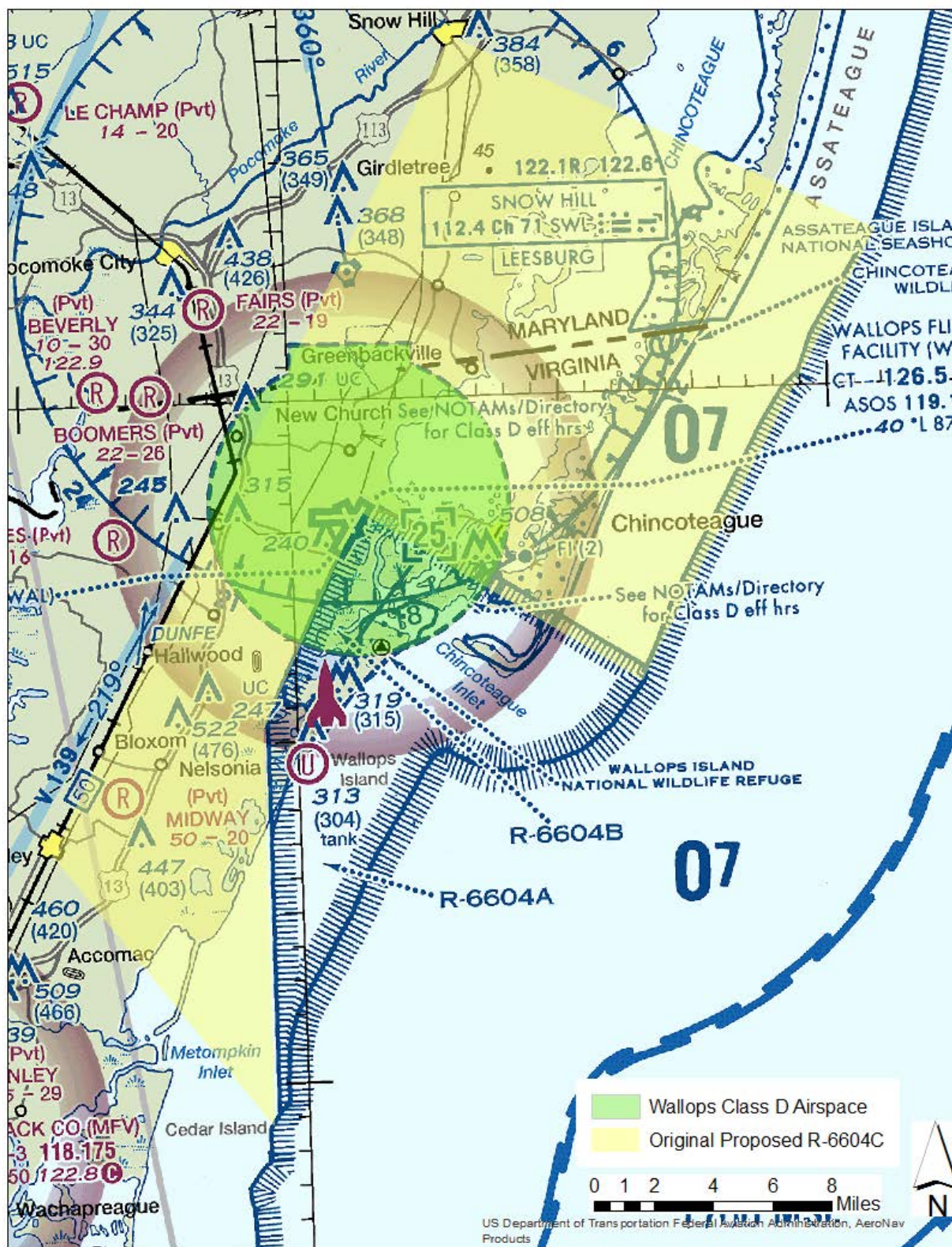


Figure 2-3: Original Proposed R-6604 Expansion

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3 Affected Environment and Environmental Consequences

This chapter provides a description of the existing environment that could be affected by the proposed action at WFF Main Base airfield, and the potential environmental impacts of the proposed action. As directed by NEPA, CEQ regulations on implementing NEPA (40 CFR 1500-1508), NASA's regulations for implementing NEPA (14 CFR 1216), NASA NEPA management requirements (NPR 8580.1A), and FAA NEPA obligations (FAA Order 1050.1F) the description of the affected environment focuses on those resource areas potentially subject to impacts. Therefore, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact. The affected environment for this EA includes the geographic extent of the airspace, land, and water encompassed by the proposed expanded restricted area airspace.

NASA's NEPA policy requires NASA Centers to maintain an ERD that provides a detailed description of environmental resources and relating permits. There is a complete description of all resource areas in the 2016 *Environmental Resources Document for the Wallops Flight Facility* (NASA, 2016). The ERD allows the NEPA analysis to focus solely on affected resources. All resources potentially affected by the proposed action are summarized in this EA; otherwise they are incorporated by reference. The 2016 ERD can be accessed on the World Wide Web at http://sites.wff.nasa.gov/code250/docs/2016_Final_ERD-REDACTED.pdf.

As discussed below, certain resource areas have been eliminated from consideration in this EA because they are not expected to be impacted by the proposed action. The environmental resources potentially affected by the proposed action and evaluated in this EA are presented in **Table 3-1** and are analyzed in Sections 3.1 through 3.5.

Resources Considered but Eliminated from Detailed Analysis

Numerous resources were considered but do not warrant detailed examination in this EA because either the resource would be unaffected by the alternatives or, there would be no measurable difference in effects between the alternatives. In this case, for a resource to not warrant detailed discussion in this EA, the resource baseline (i.e., the No Action Alternative) must have been appropriately assessed and is readily available for review in another NEPA document or in the 2016 ERD. In accordance with FAA Order 1050.1F, for those resources not warranting detailed discussion, a brief description and justification follows **Table 3-1**.

Table 3-1: Resources Considered for Analysis in this EA

Resource Considered	Analyzed in Detail in this EA?	If Yes, EA Section If No, Rationale for Elimination	If No Change to Current Baseline Conditions, Refer to ERD Section Number
<i>Social Environment</i>			
DOT Act Section 4(f) Lands	Yes	Section 3.1	NA
Airspace Management	Yes	Section 3.2	NA
Health and Safety	Yes	Section 3.3	12.5
General/Civil Aviation	Yes	Section 3.4	11.6.4, 13
Land and Water Uses	No	No change to baseline conditions.	4.7
Cultural Resources	No	No change to baseline conditions.	11
Population	No	No effect on resource.	12.1
Employment and Income	No	No effect on resource.	12.3, 12.4
Environmental Justice	No	No change to baseline conditions.	12.2
<i>Biological Environment</i>			
Vegetation	No	No effect on resource.	5.1
Wildlife Management	No	No change to baseline conditions.	5.3
Terrestrial Wildlife and Birds	No	No change to baseline conditions.	5.2
Special Status Species	No	No change to baseline conditions.	5.4
<i>Physical Environment</i>			
Noise	Yes	Section 3.5	10
Air Quality	No	No change to baseline conditions.	2.3
Surface Waters	No	No effect on resource.	3.1
Stormwater	No	No effect on resource.	3.2
Wastewater	No	No effect on resource.	3.2.1
Wetlands	No	No effect on resource.	3.6
Floodplains	No	No effect on resource.	3.7
Coastal Zone	No	No effect on resource.	3.8
Geology, Topography, and Soils	No	No effect on resource.	4.1, 4.2, 4.4 4.5
Environmental Restoration	No	No change to baseline conditions.	4.8
Hazardous Materials and Waste	No	No change to baseline conditions.	6, 7, 8, 9

Social Environment

Land and Water Uses: WFF is located in Accomack County, Virginia, in the northern area of Virginia's Eastern Shore on the Delmarva Peninsula. The facility is divided into three distinct land areas: the Main Base, Wallops Mainland, and Wallops Island. The Main Base is largely developed and consists of various land uses. Most acreage at the Main Base is dedicated to airfield operations. Small tracts of land to the west, directly abutting WFF, are zoned industrial, residential, or general business by Accomack County; however, the majority of the adjacent land is zoned agricultural (Accomack County, 2014). The Town of Chincoteague, located approximately 8 km (5 mi) east of the Main Base on Chincoteague Island, is the largest community in the area, with approximately

4,300 permanent residents. The island attracts a large tourist population during the summer months to visit the public beaches and attend the annual Assateague Island pony swim and roundup in July. During the summer months, the Island population expands to approximately 15,000 people (**Town of Chincoteague, 2010**). The Wallops Island National Wildlife Refuge (NWR) is located east of the Main Base and is under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). This refuge, which is not open to the general public, consists of approximately 150 hectares (375 acres) of mostly salt marsh and some forested land across Route 175 from the Main Base.

The current *Accomack County Comprehensive Plan* was amended in February 2014 and is intended to guide the future social, economic and physical development of Accomack County to ensure the provision of adequate, quality, community facilities and the maintenance of a healthy, safe, orderly, and harmonious environment (**Accomack County, 2014**).

NASA has recently participated with Accomack County and the Navy's Surface Combat Systems Center in the preparation of the Accomack County / Wallops Island Joint Land Use Study (JLUS). A primary input to the JLUS was WFF's range hazard areas within the County where special considerations (e.g., airfield accident potential zones) could be necessary to ensure both public safety and NASA's ability to meet mandatory range safety criteria. The principal objective of the JLUS was to identify land use issues that may impact the operational capabilities of WFF, and to identify actions participating agencies can pursue to ensure that incompatible development does not impact the facility's future mission requirements. Through the JLUS process, an action plan to guide future planning efforts was established (**Accomack County, 2015**).

The Proposed Action would not impact the land or water use or existing land management plans on or around WFF; therefore, this resource is not considered further in this analysis.

Cultural Resources: In accordance with Sections 106 and 110 of the National Historic Preservation Act (NHPA) of 1966, as amended, NASA has entered into a Programmatic Agreement with the Virginia State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation to outline how WFF will manage its cultural resources as an integral part its operations and missions (**NASA, 2014a**). Under this Programmatic Agreement, certain activities were identified to have limited potential to affect historic properties and do not require SHPO review. These exempted activities include manned and unmanned, fixed or rotary wing aircraft flights from either the Main Base runways or from the Wallops Island UAS airstrips; therefore, the Proposed Action would not impact cultural or historic resources on or around WFF and this resource is not considered further in this analysis.

Population, Employment and Income: The majority of WFF employees (civil servants and contractors) are residents of Accomack County as well as four additional counties: Northampton County in Virginia; and Somerset, Wicomico, and Worcester counties in Maryland. Population levels for the five counties range from a low of approximately 12,000 people in Northampton County to approximately 100,000 people in Wicomico County, with the Virginia counties

representing approximately 0.5 percent of that state's population and the Maryland counties representing approximately 3.0 percent of that state's population (**USCB, 2016**).

All five counties have a lower per capita income than their respective states as a whole; however, none of these counties includes major urban centers. The poverty data indicate that all five counties also have a higher percentage of the population living in poverty than their respective states. Northampton County has the highest percentage of population living in poverty, at more than double the Virginia average. Accomack and Northampton Counties are both approximately average in the region in terms of unemployment rates. It is also notable that employment fluctuates seasonally in this region (due to farm labor and summer tourism labor), with higher employment during the months of June through October.

NASA employment categories at WFF consist largely of managerial, professional, and technical disciplines with higher than regional average salaries. The 2015 average salary for Civil Servants at WFF was approximately \$100,500. The range for the middle 50% of the Civil Servants' salary was between approximately \$92,000 and \$115,000 (**Billger, 2015**). WFF mean annual income exceeded the median family income of \$39,389 for Accomack County and \$34,656 for Northampton County in 2014. Due to the gap between salaries of WFF employees and most area residents, the facility contributes considerably to the local economy.

The Proposed Action would not change the population levels, employment, or economic opportunities on or around WFF; therefore, these resources are not considered further in this analysis.

Environmental Justice: Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, tasks "each federal agency [to] make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations." In 2014, WFF prepared an Environmental Justice Implementation Plan that considered the programs, policies and activities at WFF with impacts that extended beyond the boundaries of the facility (**NASA, 2014b**). This plan looked at the Census Tract Block Group level of data for Accomack County to determine which Block Groups have higher percentages of minority populations or children when compared to the County. When compared to Accomack County as a whole, Census Tract 902, Block Group 3, has a higher percentage of minorities (42.3 percent in the block group versus 38.9 percent in Accomack County). The type and intensity of effects of the proposed action on minority or low income populations would be the same as those affecting individuals of all other ethnicities or income-levels. Census Tract 9802, Block Group 1, has a higher percentage of children under the age of 21 than Accomack County.

Like the 2014 Environmental Justice Implementation Plan, this EA used levels of noise as the metric to measure impacts to at risk populations (refer to **Section 3.5**, below for more information

on potential noise impacts). Expansion of the Restricted Area Airspace would not change the existing Day Night Average Sound Level (DNL) of 65 decibels (dB) and above noise zone contour for the WFF airfield and, although this contour extends into Accomack County, it does not encompass either of these Block Groups. Therefore, this resource is not considered further in this analysis.

Biological Environment

Vegetation: Approximately 63 percent of the Main Base is open space for runway clear zones or developed areas. The area around the runways is maintained as grassland through regular mowing. Approximately 493 hectares (1,217 acres) at WFF Main Base have been classified as developed, 116 hectares (287 acres) as forested/shrub-scrub, 22 hectares (54 acres) as open habitats (i.e., grassland/herbaceous), and 6 hectares (14 acres) as open water by the USGS 2006 National Land Cover Database (Fry et al., 2011). The National Land Cover Database is a detailed land surface reference based on Landsat satellite images. Forested areas occur in the southwestern and northwestern portions of the facility. Dominant species in upland forests at WFF Main Base include loblolly pine (*Pinus taeda*), oaks (*Quercus* spp.), hickories (*Carya* spp.), tulip-poplar (*Liriodendron tulipifera*), dogwood (*Cornus florida*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and sassafras (*Sassafras albidum*). Additionally, wetlands (discussed below) have been classified at WFF Main Base.

The Virginia Department of Conservation and Recreation (VDCR), Division of Natural Heritage, has indicated the occurrence of two conservation sites on WFF Main Base: Little Mosquito Creek Conservation Site and Wallops Island Seeps Conservation Site. The Little Mosquito Creek Conservation Site is designated due to the occurrence of a rare habitat type, Tidal Oligohaline Marsh, while the Wallops Island Seeps Conservation Site is designated due to the occurrence of a rare plant (low frostweed [*Crocianthemum propinquum*]) and a rare habitat type, Coastal Plain/Outer Piedmont Seepage Bog.

The Proposed Action would not be expected to impact vegetation or the conservation sites on or around WFF; therefore, this resource is not considered further in this analysis.

Wildlife Management: An important component of aviation safety at WFF is its ongoing wildlife hazard management program. The purpose of the program is to mitigate both short- and long-term hazards to aviation. Since 2001, the USDA Animal and Plant Health Inspection Service's Wildlife Services Division has maintained a full-time presence at WFF to disperse and remove birds and mammals from the airfield. Under the WFF wildlife hazard management program, the WFF Aviation Safety Working Group consisting of USDA, Airport Management, Airport Operations, Aviation Safety Office, Safety Office, and Senior Management meets quarterly to identify, manage, and monitor wildlife-related hazards at WFF. Program objectives include reducing the attractiveness of WFF to birds and wildlife by minimizing food sources, nesting sites, and roosting habitat within the airfield clear zones. USDA personnel regularly implement various management techniques within and adjacent to the WFF airfield, which can include: identifying and

manipulating species habitat and roosts, employing techniques to disperse species, and, if deemed necessary, removal of birds and/or mammals that pose a hazard to human health and aviation safety under appropriate Federal and state permits (NASA, 2014c). The Proposed Action would not impact wildlife management on or around WFF; therefore, this resource is not considered further in this analysis.

Terrestrial Wildlife: Terrestrial wildlife includes all common animal species, with the exception of those identified as special status species (discussed below). The terrestrial wildlife category includes amphibians, reptiles, mammals, and birds. Native bird species protected under the Migratory Bird Treaty Act (MBTA) are discussed as special status species, below.

Large mammal species documented at WFF include the white-tailed deer (*Odocoileus virginianus*) and red fox (*Vulpes vulpes*). Small mammals include the squirrel (*Sciurus carolinensis*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), whitefooted mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), marsh rice rat (*Oryzomys palustris*), and eastern cottontail (*Sylvilagus floridanus*). River otters (*Lontra canadensis*) have been observed on the marsh/upland interface. Amphibians include the Fowler's toad (*Anaxyrus fowleri*) and green tree frog (*Hyla cinerea*). Reptiles include the eastern rat snake (*Pantherophis alleghaniensis*), black racer (*Coluber constrictor constrictor*), hognose snake (*Heterodon platyrhinos*), snapping turtle (*Chelydra serpentina*), eastern box turtle (*Terrapene carolina carolina*), northern fence lizard (*Sceloporus undulatus*), fivelined skink (*Eumeces fasciatus*), and diamondback terrapin (*Malaclemys terrapin*) (NASA 2008, 2011).

This EA used levels of noise as the metric to measure impacts to wildlife. Based on noise studies (Grubb and King, 1991; Ellis et al., 1991; Black et al., 1984; Conomy et al., 1998), some species may endure longer-term effects, due to repeated physiological responses, but most species would be expected to acclimate or habituate to noise exposure after short-term effects. Given that the current air operations at WFF Main Base would not change and that the likelihood that wildlife on and around the Main Base are already habituated to aircraft noise, the Proposed Action would not be expected to impact wildlife on or around WFF. Therefore, this resource is not considered further in this analysis.

Special Status Species: Special status species include any species which is listed, or proposed for listing, as threatened or endangered under the provisions of the Federal Endangered Species Act (ESA); species protected under other Federal laws including the Bald and Golden Eagle Protection Act (BGEPA) or the MTBA; species considered to be threatened or endangered under Virginia's ESA; or those species or habitats of conservation concern identified by the Commonwealth of Virginia. The USFWS and the National Marine Fisheries Service (NMFS) share federal jurisdiction for federally threatened and endangered species, with USFWS having lead responsibility on the land and NMFS having lead responsibility on the marine environment. MTBA protected species, bald eagles (*Haliaeetus leucocephalus*; state threatened and under the protection of the BGEPA), and the federally threatened northern long-eared bat (*Myotis*

septentrionalis) are known to nest and/or roost in the forested areas around the WFF Main Base. Marine species including the federally and state endangered Atlantic sturgeon (*Acipenser o. oxyrinchus*) and federally protected marine mammals and sea turtles may migrate and forage through Chincoteague Bay and in the waterways around the Main Base.

Virtually all birds native to WFF are protected under the MBTA. The MBTA was designed to protect migratory birds and birds of conservation concern (BCC), including their eggs, nests, and feathers. BCC birds are species that, without additional conservation measures, are likely to become candidates for listing under the ESA. If an agency determines that implementation of a Proposed Action may result in a significant adverse effect on a population of a migratory bird species or BCC, they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate those identified significant adverse effects. Blackbirds, waterfowl, and gulls are the three most numerous bird groups observed at and in the area surrounding WFF Main Base (USN, 2013). During the winter months, individuals belonging to these species groups may form large flocks and use the natural areas in the vicinity of WFF for a night-time roosting, dispersing during the day to forage in the surrounding agricultural fields and returning in the evening to roost. During the spring and summer months, these daily migrations are less common and typically would not include large numbers of flocking birds. Nesting, foraging, and migrating MBTA and other bird species are likely habituated to noise disturbance at WFF, judging by their continual exposure to existing low-level flight operations; therefore, no impacts are anticipated to avian species and they are not considered further in this analysis.

On March 26, 2015, the College of William and Mary's Center for Conservation Biology flew a raptor survey over Virginia's eastern shore. Near the Main Base, biologists observed an active bald eagle nest in the Wallops National Wildlife Refuge, across Route 175 from the airfield, and a second active nest across Little Mosquito Creek from the M-Area (Watts, 2016). These two nesting pairs of bald eagles are likely habituated to noise disturbance at WFF, judging by their proximity to the airfield, continual exposure to existing low-level flight operations, and by the longevity and productivity of their nests; therefore, no impacts are anticipated to this species and they are not considered further in this analysis.

A 2014-2015 survey of northern long-eared bats did not detect this species in northern Accomack County; however, this lack of evidence does not disprove the potential for the species to occur here, especially within wooded areas (Ford, 2016). Specific to WFF, in 2008, acoustic bat surveys were conducted in the marshes on Wallops Island, with 0.3 percent of the calls identified attributable to the myotis guild to which this species belongs (Stantec Consulting, 2008). While northern long-eared bats were not separated from the rest of the guild, it is reasonable to assume that this species could occur in the vicinity of WFF, even if in low numbers. Given the current aircraft operations at WFF Main Base, northern long-eared bats roosting near the facility are likely habituated to aircraft activity and noise. Additionally, the USFWS Final ESA 4(d) Rule on northern long-eared bats states that white nose syndrome, not anthropogenic effects, is the leading

threat to these species. The Rule regulates the removal of maternal roosting trees during the period from June 1 to July 31. As no tree clearing is considered under the Proposed Action, no impacts are anticipated to this species and they will not be considered further in this analysis.

The Atlantic sturgeon is a federally and state endangered (state Tier II SGCN), long-lived, estuarine dependent, anadromous. These fish range from Newfoundland to the Gulf of Mexico and are highly migratory. Adults spend the majority of their lives in estuarine and marine waters, migrating to spawn in freshwater natal rivers in the spring and early summer. Atlantic sturgeon are benthic feeders and typically forage on benthic invertebrates (crustaceans, worms, mollusks, etc.) (NMFS, 2016).

The only marine mammal species expected to occur in the waters surrounding the WFF Main Base is the bottlenose dolphin (*Tursiops truncatus*). Bottlenose dolphins could occur in Chincoteague Bay (located to the northeast of WFF Main Base, between the mainland and Chincoteague Island) in spring, summer, and fall (Waring et al., 2013). During the winter (January to March), bottlenose dolphins are not likely to be found north of the southern Virginia coastline and would, therefore, not occur within Chincoteague Bay (Waring et al., 2013).

The tidal marsh areas surrounding the WFF Main Base serve as nursery grounds for a variety of fish species, due to the protection the marsh grasses provide and the abundance of food. Marsh grasses for example, provide protection to the spot (*Leiostomus xanthurus*), the northern pipefish (*Syngnathus fuscus*), the dusky pipefish (*Syngnathus floridae*), and bay anchovy (*Anchoa mitchilli*) (VDCR, 1996).

Transmission of noise from aircraft into the water would be possible; however, animals would have to be at or near the surface at the time of an overflight to be exposed to elevated sound levels. Laney and Cavanagh (2000) modeled the F/A-18 Hornet in supersonic flight to obtain peak noise levels at the water surface and at depth. According to their research, “the principal reason for the lack of impact (to marine animals) from under water noise energy is that even for the strongest noise events (i.e., sonic booms) and good coupling to the water, the peak pressure and energy flux density are not sufficient to cause injury or harassment, at least under currently accepted criteria and thresholds.”

Smaller delphinids, including the bottlenose dolphin, generally react to aircraft overflights either neutrally or with a startle response (Wursig et al. 1998). It has also been reported that dolphins generally show no reaction to the overflight of survey aircraft unless the aircraft’s shadow passes directly over them (Richardson et al. 1995). As it would be unlikely that marine mammals or fish would be in the impact area during overflights, there is very low probability of a shadowing effect. Additionally, as noted above, the energy from aircraft noise would not impact marine animals. Any chance exposure of a marine animal to aircraft and the accompanying change in noise would last for only seconds as the aircraft quickly passes overhead. Considering the fact that

overflight would be temporary and intermittent in nature, the Proposed Action would not impact marine animals near WFF; therefore, these resources are not considered further in this analysis.

Physical Environment

Air Quality: The Clean Air Act (CAA), which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR 50) for pollutants considered harmful to public health and the environment. The EPA Office of Air Quality Planning and Standards has set NAAQS for seven principal pollutants, which are called "criteria" pollutants. The CAA established two types of NAAQS for these pollutants: primary and secondary. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Virginia's ambient air quality standards mirror the NAAQS. WFF is located in an attainment area for all six NAAQS listed criteria air pollutants. An attainment area is an area considered to have air quality that is as good as or better than the NAAQS as defined by the CAA.

Mobile air emissions, such as those from aircraft, are not subject to the Prevention of Significant Deterioration standards; however, the Prevention of Significant Deterioration thresholds provide a method to put the volume of mobile emissions in context as related to the NAAQS. Baseline annual aircraft operating emissions at WFF have been estimated to be below the limit for each criteria pollutant (USN, 2013). The Proposed Action would not change operational levels at WFF and, therefore, would not be expected to impact air on or around WFF. This resource is not considered further in this analysis.

Surface Waters, Stormwater, and Wastewater: There are approximately 11,533 m (37,840 ft) of surface waters on WFF Main Base. As such, WFF maintains a Stormwater Pollution Prevention Plan to ensure that its operations have minimal impact on stormwater quality and runoff to surface waters. WFF Main Base has both natural drainage patterns and stormwater swales and inlets to intercept and divert stormwater flow. Stormwater drains to Little Mosquito Creek from the northern portion of the facility; Mosquito Creek, Jenneys Gut, and Simoneaston Bay from the eastern and southeastern portions of the facility; and Wattsville Branch on the western and southwestern portions of the facility. All stormwater from WFF Main Base eventually flows to the Atlantic Ocean. WFF Main Base outfalls are protected with rip-rap to reduce flow velocity and minimize damage to the receiving waterways. In addition to the stormwater management system, sediment and erosion control measures are implemented to control runoff from construction, demolition, restoration, and site maintenance projects. Current best management practices employed for stormwater management and erosion and sediment control include installing silt fences, utilizing stone construction vehicle entrances, maintaining vegetative buffer strips, and quickly reseeding bare soils. No construction or demolition is proposed under this Action.

In Virginia, DEQ administers the program as the Virginia Pollutant Discharge Elimination System (VPDES). A VPDES permit authorizes potential or actual discharge of pollutants from a point source to surface waters under prescribed conditions and limitations. VPDES permit number. VA0024457 was issued to WFF by the DEQ on August 17, 1989, with the most recent renewal date being October 1, 2014 which expires September 30, 2019. Airfield operations are included in the WFF VPDES permit; no aircraft de-icing is conducted at the facility. Under this permit, the Main Base maintains 11 industrial stormwater outfalls, four non-industrial stormwater outfalls, and one Federally Owned Treatment Works process outfall. Main Base wastewater is primarily collected in through lift stations and gravity sewers. The treatment works has a design capacity of approximately 1,100,000 liters (300,000 gallons) per day. The current average daily discharge to Little Mosquito Creek is approximately 200,000 to 225,000 liters (50,000 to 60,000 gallons).

The Proposed Action would not be expected to directly or indirectly impact surface water, stormwater, or wastewater on or around WFF; therefore, these resources are not considered further in this analysis.

Wetlands, Floodplains, and Coastal Zone: Primarily tidal and, to a lesser degree, non-tidal wetlands have been identified at WFF by the National Wetlands Inventory (NWI), a nation-wide wetlands aerial imagery mapping effort conducted by the USFWS (**USFWS, 2016**). Additional site-specific delineations have been conducted in support of development activities (**Timmons Group, 2009a; 2009b; 2009c**). Confirmed jurisdictional determinations have been obtained from the U.S. Army Corps of Engineers (USACE) for portions of the wetlands at WFF. The remaining NWI delineations are for planning purposes only and must be verified by the USACE prior to conducting activities with the potential to impact wetlands.

Approximately 153 hectares (376 acres) of wetlands, classified into five different wetland types, have been identified by the NWI at WFF Main Base. Estuarine and marine wetlands, which typically occur adjacent to deep water tidal habitats, primarily occur along Wattsville Branch, Little Mosquito Creek, and in the northeastern portion of the facility. Freshwater forested/shrub wetlands border some of the smaller drainages in the northern and eastern portions of the facility. Freshwater emergent wetlands border some of the smaller drainages in the eastern and southern portions of the facility. Finally, a small (approximately 0.2 hectares [0.5 acre]) freshwater pond has been identified in the extreme western portion of the facility. (**USFWS, 2016**).

Floodplains are lowland areas located adjacent to bodies of water in which the ordinary high water level fluctuates on an annual basis. Along streams and creeks, the ordinary high water level may fluctuate as a result of a precipitation event. Tidally influenced waters may fluctuate due to spring tides or as a result of a large storm event (e.g., storm surge). When one of these events is large enough, it causes the water level to exceed the ordinary high-water mark and enter the adjacent floodplain. Floodplains are often discussed in terms of the 100-year and 500-year floodplain zones. The 100-year flood is a flood having a 1% chance of occurring in any given year. The 100-year flood is also known as the base flood. The 500-year floodplain designates the area inundated during

a storm having a 0.2% chance of occurring in any given year. 2015 Flood Insurance Rate Map Community Panels 51001C0265G and 51001C0255G (**FEMA, 2016**) show 100-year and small pockets of 500-year floodplains along portions of the northwest, north, and northeast perimeters of the Main Base which include lower elevation areas primarily defined by the topography along Little Mosquito Creek and Jenneys Gut.

Under Section 307 of the Coastal Zone Management Act (CZMA, 16 U.S.C. 1456), Federal agency activities that have coastal effects must be consistent, to the maximum extent practicable, with federally approved enforceable policies of a state's Coastal Zone Management (CZM) Program. Virginia DEQ is the lead agency for the Virginia CZM Program. Although Federal lands are excluded from Virginia's Coastal Management Area, any activity on Federal land that has reasonably foreseeable coastal effects must be consistent with the enforceable policies of the CZM Program (**Virginia DEQ, 2016**). There are nine enforceable policies of Virginia's CZM Program that must be considered when determining Federal Consistency. These include: fisheries management, subaqueous lands management, wetlands management, dunes management, non-point source pollution control, point source pollution, control shoreline sanitation, air pollution control, and coastal lands management. Because many activities at WFF may affect the surrounding coastal areas, these actions are subject to the Federal Consistency requirement. The Proposed Action is covered by the Coastal Zone Consistency Determination performed for the 2005 WFF Site-wide EA (**NASA, 2005**). The DEQ concurred with the Coastal Zone Consistency Determination in File No. DEQ 08-152F.

The Proposed Action would not be expected to directly or indirectly impact wetlands or floodplains on or around WFF, and has been determined to be consistent with the Virginia CZMP; therefore, these resources are not considered further in this analysis.

Geology, Topography, and Soils: The WFF Main Base lies within three geologic units: Omar Formation— Accomack Member, Marsh and Intertidal Mud Deposits, and Joynes Neck Sand (**USGS, 2016**). Each of these units is generally composed of sedimentary deposits of sand, gravel, silt, clay, and peat. The majority of the WFF Main Base is located on a high terrace landform with elevations ranging from approximately 7.5 to 12 m (25 to 40 ft) MSL (**NASA, 2016**). The northern and eastern portions are located on low terraces and tidal marshes; elevations in these areas range from 0 to 7.5 m (0 to 25 ft) MSL. Eleven soil types occur at the Main Base (**USDA NRCS, n.d. [a]**). More than 89 percent of these soils are identified as three soil types: Bojac fine sandy loam, 0 percent to 2 percent slopes; Molena loamy sand, 6 percent to 35 percent slopes; and Chincoteague silt loam, 0 percent to 1 percent slopes, frequently flooded. The majority of the airfield occurs on Bojac fine sandy loam (**USDA NRCS, n.d. [b]**).

As no construction or demolition is proposed, the Proposed Action would not be expected to impact geology, topography, or soils on or around WFF; therefore, these resources are not considered further in this analysis.

Environmental Restoration: The WFF Environmental Restoration Program manages the investigation, response, and remedial activities of the historically contaminated NASA sites at WFF under the Administrative Agreement on Consent (AAOC) executed between NASA and the EPA, with NASA serving as the lead agency (**EPA, 2004**). The AAOC was issued under the authority of the Resource Conservation and Recovery Act as amended by the Hazardous and Solid Waste Amendments. By agreement, it integrates the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act, into meeting the obligations of the AAOC. The AAOC applies to Areas of Concern (AOCs) from past releases of hazardous substances, waste and/or constituents by NASA at WFF.

Several AOCs have been identified at WFF as a result of a series of assessments conducted under the oversight of EPA and DEQ. Projects include NASA sites, former Navy sites, and petroleum-related sites contaminated from past operations. Currently, NASA has 27 AAOC CERCLA Sites (10 of which are active), 104 former Navy AOCs managed by USACE (three of which require site investigations), 22 petroleum sites (one of which is active); and 15 former Navy AOCs managed under agreement by NASA (13 of which are active). In addition to the CERCLA and petroleum sites, potential Munitions and Explosives of Concern sites were identified on Wallops Island and the WFF Visitor Center/Boat Basin area (**NASA, 2016**).

The Proposed Action would not be expected to impact environmental restoration sites on WFF; therefore, this resource is not considered further in this analysis.

Hazardous Materials and Waste: The WFF Main Base is classified as a large-quantity hazardous waste generator because it has the potential to generate more than 1,000 kilograms (approximately 2,200 pounds) of hazardous waste per month. The WFF Environmental Office manages hazardous waste generation, including prevention plans, inspection, onsite transportation, storage, shipment of all hazardous waste as well as annual training to all contractor and civil service employees who handle hazardous wastes. Management plans include the Integrated Contingency Plan which satisfies the requirements of a Spill Prevention, Control, and Countermeasure Plan; an Oil Discharge Contingency Plan; and a Hazardous Waste Contingency Plan; as well as a Pollution Prevention Plan that is reviewed annually. WFF Main Base stores its hazardous waste in two separate temporary (less than 90-day) accumulation areas: one for used oil and one for all other hazardous waste. Hazardous waste may be stored for up to 90 days from the date of initial accumulation. Prior to reaching 90 days from the date of initial accumulation, the waste is picked up by a licensed hazardous waste transporter and taken to a licensed treatment, storage, and disposal facility. WFF biennially reports volumes generated of both hazardous and non-hazardous waste. According to the 2015 biennial report, 23,033 kilograms (50,779 pounds) of hazardous waste were generated on the Main Base (**NASA, 2016**). Since the Proposed Action would not be expected to generate or impact hazardous material or waste management on WFF, these resources are not considered further in this analysis.

3.1 DOT Act Section 4(f) Resources

3.1.1 Regulatory Context

The DOT Act of 1966 (49 U.S.C., Subtitle I, Section 303(c)), as amended, includes a special provision—Section 4(f)—that stipulates that DOT agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless the following conditions apply:

1. There is no feasible and prudent alternative to the use of such land; and
2. The project includes all possible planning to minimize harm to the land resulting from such use.

Because the FAA is a DOT agency with regulatory jurisdiction over the Proposed Action, this EA also includes an evaluation of DOT Section 4(f) lands.

3.1.2 Affected Environment

Several landholdings of the Chincoteague National Wildlife Refuge (CNWR) that are Section 4(f) lands are located within the vicinity of Wallops Island. Assawoman Island, which lies immediately south of Wallops Island, and the northern portion of Metompkin Island, which lies immediately south of Assawoman Island, are owned by the USFWS. Assawoman Island is closed year round except for seasonal boat and fishing access on the southern tip. The northern part of Metompkin Island is owned by the USFWS and the southern half is owned by The Nature Conservancy; both portions are open to the public for low impact, recreational daytime activities, such as hiking, bird watching, fishing, and photography. Assateague Island, also owned by USFWS and co-managed with the National Park Service's Assateague Island National Seashore, lies to the north of Wallops Island. Assateague Island is open year-round and has been used in the past as a viewing site for WFF ELV launches.

3.1.3 Environmental Consequences

3.1.3.1 No Action Alternative

Under the No Action Alternative, WFF would conduct operational missions and activities that are within the installation's current envelope. Impacts from all operational missions and activities under the No Action Alternative, including those to Section 4(f) lands, have been covered by previous NEPA documents that are incorporated by reference into this EA. Both military and non-military entities have been sharing the use of the airspace that encompasses and surrounds R-6604A/B and VACAPES for more than 30 years. Military, commercial, and general aviation activities have established an operational co-existence consistent with federal, state, and local plans and policies and compatible with each interest's varying objectives. The No Action Alternative includes training and testing operations that are, and have been, routinely conducted in the area for decades; however, as WFF continues the testing of unproven and

experimental aircraft systems, the risk to non-participating aircraft increases. Ongoing, continuing operations would continue to use R-6604A/B and offshore W-386 and would continue to overfly the CNWR, Section 4(f) lands. Although the nature and intensity of use varies over time and by an individual area, the continuing training operations represent precisely the kinds of operations for which these airspace areas were created (i.e., those that present a hazard to other aircraft). As such, implementation of the No Action Alternative would have no impact on Section 4(f) lands lying under R-6604A/B.

3.1.3.2 Proposed Action

The potential effects of the Proposed Action on Section 4(f) lands would be the same as those under the No Action Alternative. FAA is consulting with CNWR and the results of this consultation will be summarized in the Final EA.

3.2 Airspace Management

The safe, orderly, and compatible use of the nation's airspace is made possible through a system of flight rules and regulations, airspace management actions, and air traffic control procedures. The National Airspace System (NAS) is designed and managed to protect aircraft operations around most airports and along air traffic routes connecting these airports, as well as within special areas where activities such as military flight testing and training are conducted. The FAA has the overall responsibility for managing the NAS and accomplishes this through close coordination with state aviation and airport planners, military airspace managers, and other organizations. There are two categories of airspace or airspace areas: regulatory and non-regulatory. Within these two categories, there are four types of airspace: controlled, uncontrolled, special use, and other.

Controlled airspace has defined dimensions within which air traffic control service is provided; it is categorized into five separate classes: Classes A through E (**Figure 3-1**). These classes identify airspace that is controlled, airspace supporting airport operations, and designated airways affording enroute transit from place to place. **Uncontrolled airspace** is designated Class G. **Special Use Airspace** has defined dimensions where activities must be confined because of their nature or where limitations may be imposed upon aircraft operations that are not a part of those activities. Certain categories of SUA within the NAS include restricted areas and Warning Areas. Restricted Area Airspaces separate potentially hazardous activities, such as air-to-ground training, from other aviation activities. General aviation or civilian aircraft must have permission from Air Traffic Control (ATC) to enter a restricted area when it is active or "hot." A Warning Area (W-) is a military use airspace of defined dimensions, extending from 5.5 km (3 nm) outward from the coast of the U.S. that contains an activity that may be hazardous to non-participating i.e., general aviation and civilian aircraft). **Other Airspace** is a general term referring to the majority of the remaining airspace.

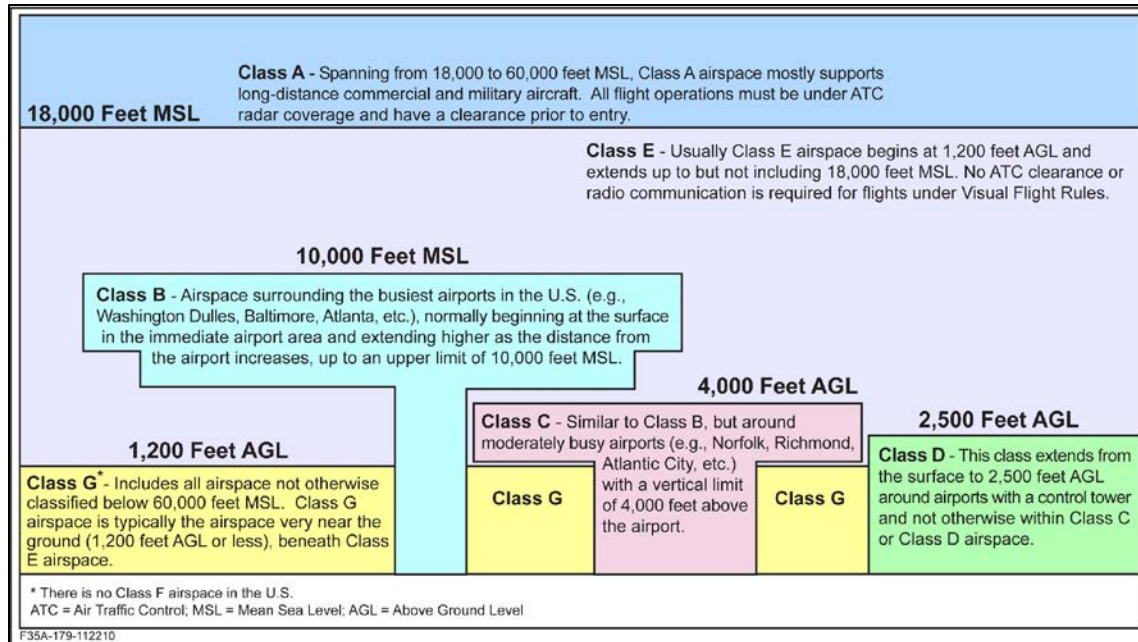


Figure 3-1: Cross Section of Airspace Classes and Their Relationships

3.2.1 Affected Environment

Around the Main Base airfield, WFF operates controlled Class D airspace which extends from the surface vertically to 760 m (2,500 ft) in an 8 km (5 mi) radius around the center of the airfield. Prior to entering the airspace, pilots are required to establish and maintain two-way radio communications with the WFF airport tower, which serves as the ATC facility. Aircraft operations at the airfield include takeoff, landing, or practice approach, each of which count as one operation. Outside of Class D airspace, and after ATC operating hours, the FAA assigns the responsibility for units of airspace to ARTCCs. The WFF airfield is located within the Washington, DC ARTCC.

WFF conducts testing of unproven and experimental manned and unmanned aircraft systems from the airfield. Modifications to the exterior of the aircraft system (e.g., science testing platforms) change the flight characteristics and handling quality of the aircraft which can produce hazardous flying conditions. Additionally, the majority of UAS at WFF are in developmental and experimental stages and have not been proven airworthy or safe to fly within the NAS. These potentially hazardous flight operations routinely require assessment of the air-to-ground transition phase of flight (takeoff, departure, approach, wave off, and landing) which can only be performed in the immediate vicinity of the airfield itself.

Due to the nature of the experimental aircraft, a Certificate of Airworthiness (COA)⁴ must be granted by the FAA. Under a COA, operations involving experimental aircraft can be conducted

⁴ A COA is an authorization issued by the FAA for a specific “test” aircraft activity that requires take-off, flying, and/or landing, including the related safety margins, within the NAS. In most cases, FAA will provide a formal response within 60 days from the time a completed application is submitted (FAA, 2016b).

within the NAS, usually with very strict limitations and under the guidance of an ATC. WFF may also conduct aeronautical research on experimental manned and unmanned aircraft that have not yet been proven airworthy. A typical scenario would be for the pilot to fly the aircraft to a safe altitude within the middle of the aircraft's operating envelope to evaluate stability and control modes. The number and frequency of flights would depend on the number of flights required to demonstrate that the experimental manned or unmanned aircraft could operate safely including satisfactory take-off, controlled flight, and satisfactory landing.

Additionally, various DOD pilots, including those from the Navy, Air National Guard, Coast Guard, Air Force, and Army, perform repetitive "touch-and-go" landings at the WFF airfield. The largest of these operations, the Navy's FCLP, is defined as the phase of required flight training that precedes carrier landing operations. It simulates, as nearly as practicable, the conditions encountered during carrier landing operations (USN, 2013). Military pilots need to be both current and proficient in landing qualification. The skills required to complete landings must be routinely practiced by pilots of all experience levels to maintain the requisite level of proficiency. In order to do that, pilots in both fleet and replacement squadrons conduct pilot proficiency training. It is important that lighting, flight patterns, and altitudes flown during proficiency training are as close as possible to what a pilot would encounter, during both day and nighttime conditions, so that pilots are fully prepared for DOD operations.

R-6604A/B is NASA controlled Restricted Area Airspace (R-) that overlies all of Wallops Island, the majority of the Mainland, and a portion of the Main Base runways (**Figure 3-2**). This Restricted Area Airspace is comprised of two independent airspace units, A and B, that may be activated individually or together. R-6604A/B is available 24 hours a day, 7 days a week from the surface to unlimited altitude. The northwestern portion of R-6604B presents some ambiguity since this portion overlies, approximately, the southeast portion of the WFF airport air traffic area. Normally, the WFF control tower is the focal point of control for all air traffic transiting the portion of R-6604B that extends into the airport air traffic area. However, the point of control for this northwest portion is relinquished to the WFF Test Director by the control tower operator when test range operations dictate a need to include unproven or experimental aircraft testing from the aeronautical research airport on the Main Base or rocket launches from Wallops Island. Non-participating aircraft must contact the WFF Range Control Center or the Washington ARTCC to obtain clearance to transit through any portion of an activated restricted area.

FACSFAC VACAPES controls and schedules the offshore Warning Areas including W-386. As a designated ATC facility, FACSFAC is responsible for all aircraft (general, military, federal, and commercial) operating within its area of responsibility, the scheduling of the offshore VACAPES Warning Areas and military operating areas (OPAREA), and the preparation of NOTAMs and Notices to Mariners (NOTMARs) for broadcast by the FAA and the USCG, respectively. FACSFAC VACAPES also coordinates ATC and flight monitoring. W-386 is available from the surface to unlimited altitude. R-6604A/B connects to the VACAPES OPAREA offshore W-386. Close coordination between FACSFAC, NASA, and FAA ATC facilities enables effective, real-

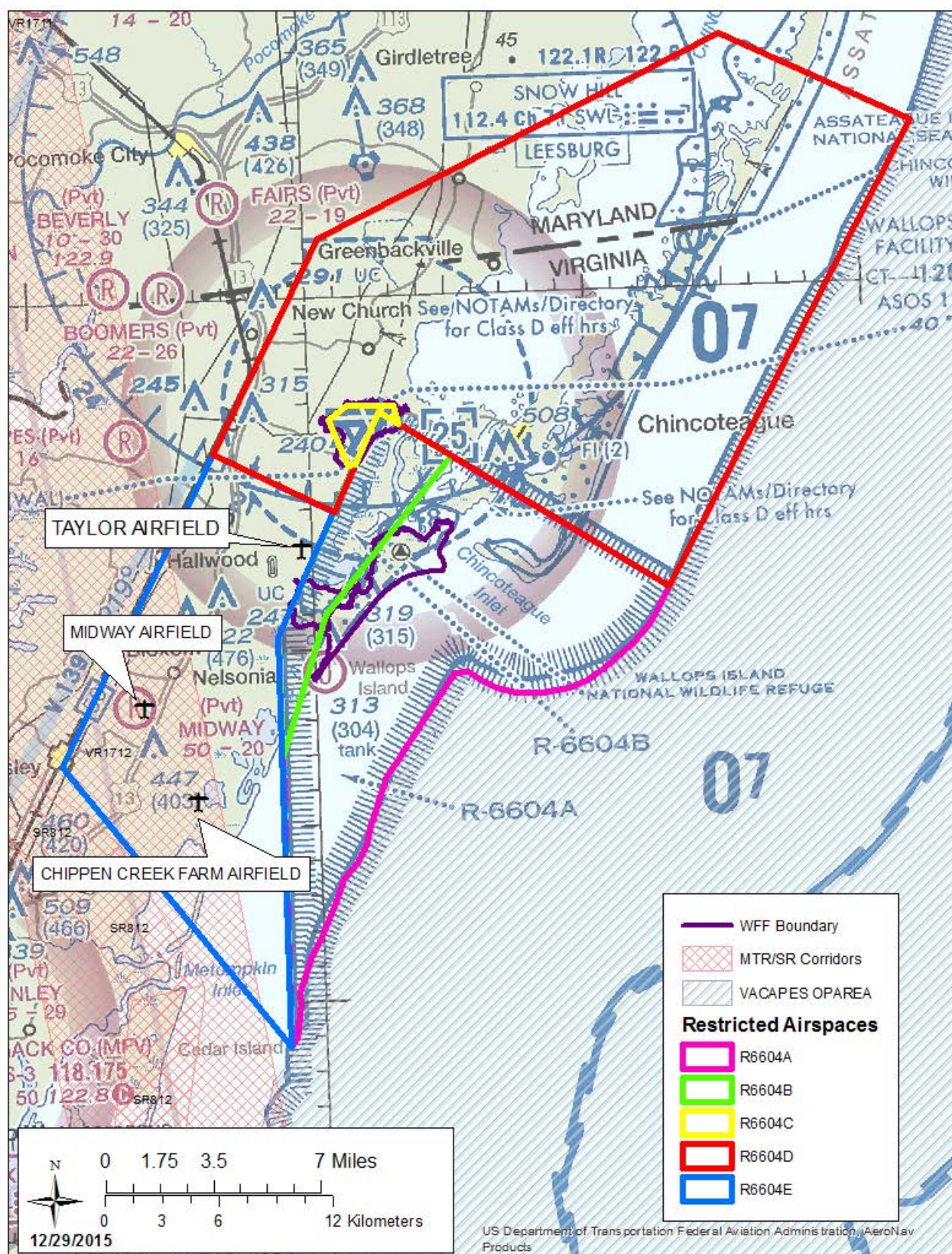


Figure 3-2: Current and Proposed Airspace Expansion

time, joint use of R-6604A/B and the VACAPES Range Complex Warning Areas. When in use by NASA or the Navy, R-6604A/B and W-386 are “hot” and the scheduled airspace blocks are closed to all non-participating users. When not in use, R-6604A/B and W-386 are “cold” and the airspace blocks are returned to the NAS allowing civilian aircraft to transit through R-6604A/B or that portion of W-386.

One 14.8 km (8 nm) wide Federal (also known as Victor [V-]) airway, V-139, borders the western edge of R-6604A/B airspace and would run inside the western edge of the proposed R-6604D/E airspaces (**Figure 3-2**). On aeronautical charts, the Minimum Enroute Altitude (MEA) is listed as a number (e.g., 6,500) along the airway and is the lowest altitude between radio fixes that assures navigational signal coverage and meets obstacle clearance requirements between the fixes. The MEA for V-139 is 610 m (2,000 ft) MSL.

General aviation pilots travel north and south along the Delmarva Peninsula following either the Atlantic coastline, Airway V-1, or Airway V-139. The FAA’s Performance Data Analysis and Reporting System (PDARS) is a NAS System designed as an integrated performance measurement tool that facilitates operational analysis to improve the NAS. The system consists of a dedicated network of computers located at FAA sites that use specialized software for collecting detailed air traffic management system data. A PDARS analysis was performed for air traffic between March 1, 2015, and March 1, 2016, in the survey area determined by the four coordinate points shown in **Figure 3-3**. The survey area included the portion of V-139 that is adjacent to the Proposed Action, as well as portions of the coastline and V-1. The PDARS concluded that air traffic flying in this area below an altitude of approximately 915 m (3,000 ft) MSL, averaged 18 VFR flights and 14 IFR flights per day for a total of approximately 32 flights per day (**FAA, 2016a**). According to the FAA, most general aviation traffic on V-139 occurs at altitudes between approximately 3,050 and 4,000 m (10,000 and 13,000 ft) MSL (**FAA, 2012**).

The 113th Wing at Joint Base Andrews owns and operates Military Training Route (MTR) visual route (VR) 1712 that crosses northwest to southeast over the southwestern corner of the proposed R-6604E airspace (**Figure 3-2**). Typically, MTRs are aerial corridors across the U.S. in which military aircraft can operate below 3,050 m (10,000 ft) faster than the maximum FAA safe speed of 250 knots (288 miles per hour [mph]) to which all other aircraft at that height are restricted. VR1712 is solely a visual route where visibility must be greater than or equal to 8 km (5 mi) and the cloud ceiling must be greater than or equal to 915 m (3,000 ft) AGL. The 113th Wing operates MTR VR1712 daily from 7:30 a.m. to sunset. The operating altitude is 150 to 460 m (500 to 1,500) ft AGL.

Slow Routes (SR) are similar to VRs except SRs are flown at airspeeds of 250 knots (288 mph) or less. Unlike instrument routes and VRs, SRs are not part of the MTR system and, therefore, have no directive guidance in the Aeronautical Information Manual or FAA Order JO 7610.4x, including weather minima. Weather minima for flight on SR routes are specified in corresponding service directives (although some routes may list weather minima in the Remarks/Special

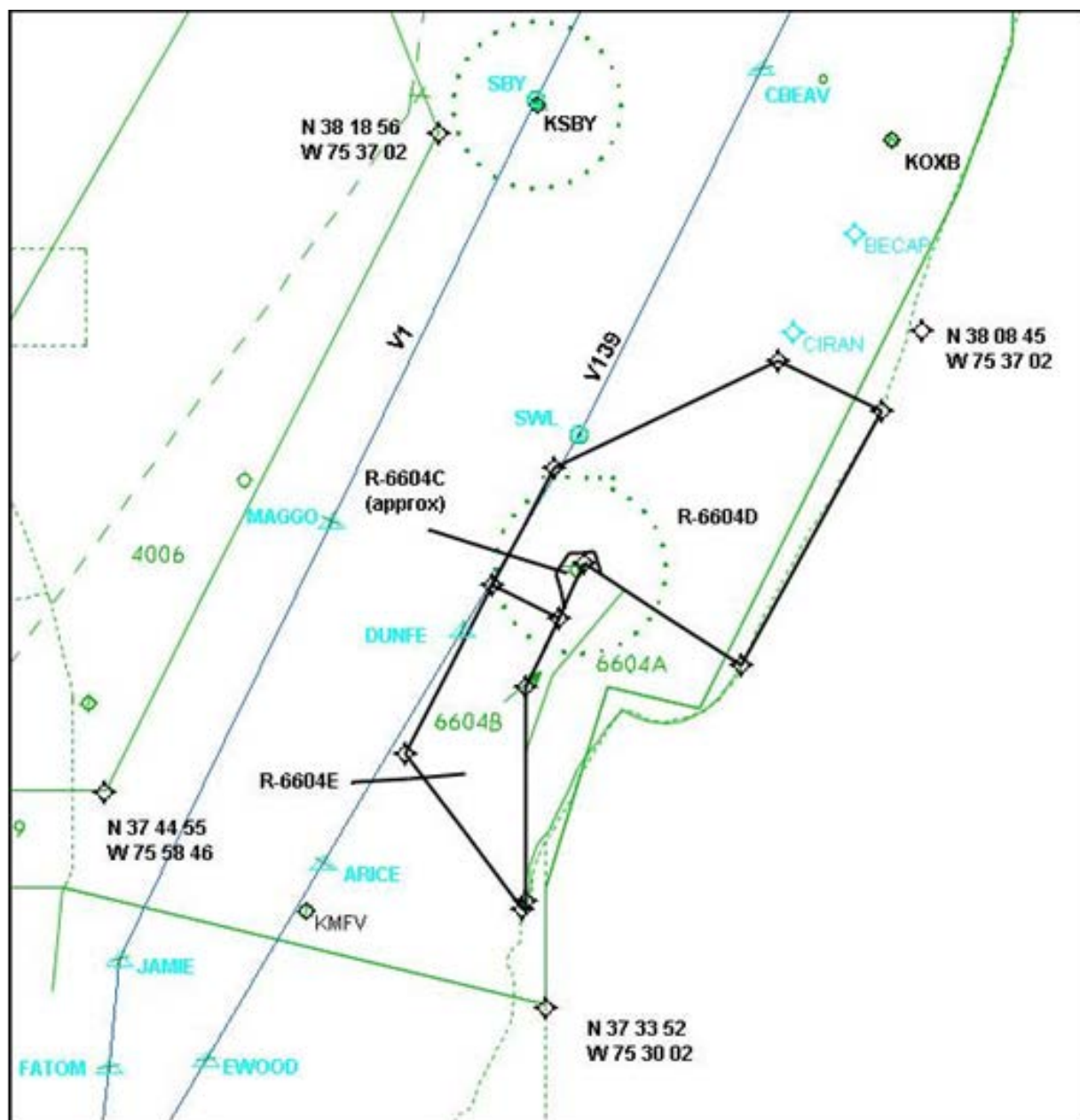


Figure 3-3 Performance Data Analysis and Reporting System Survey Area

Operating Procedures). Also, unlike instrument routes or VRs, Flight Service Stations are not notified of a scheduled SR. SR812 crosses the southwestern corner of the proposed R-6604E airspace (Figure 3-2) and is bidirectional. The combat helicopter wing at Naval Air Station Norfolk, Virginia, schedules SR812 through FACSFAC VACAPES and flies the route at 150 m (500 ft) AGL approximately twice weekly out of Norfolk and Chambers Field.

Accomack County airport lies approximately 16.7 km (9 nm) off the southwestern edge of the proposed R-6604E and would be outside the FAA required 5.5 km (3 nm) airport exclusion zone. This airport averages approximately 16,060 operations per year (AirNav, 2013). In addition, three

private airfields (Taylor, Midway, and Crippen Creek Farm) would underlie the proposed airspaces. Midway and Crippen Creek Farm airfields lie under the MTR corridor for VR-1712.

The 2015 annual airfield operations at WFF totaled 41,786 (**Ferrier, 2016**). The maximum baseline of annual airfield operations at WFF is approximately 61,000 (**USN, 2013**). Aircraft transiting through a Restricted Area Airspace or Warning Area can transit several airspace units on a single mission, each counting as one airspace operation. Thus, an aircraft passing through both R-6604A and R-6604B would constitute two airspace operations. This is true even if the units can be scheduled and used as a group; each unit is counted as a separate operation. Between October 2014 and September 2015, R-6604A was activated 324 times for a total of 5,457 hours and R-6604B was activated 246 times for a total of 2,182 hours (**Dickerson, 2016**). W-386 currently supports approximately 1,720 manned and 400 unmanned sorties, while the entire VACAPES currently supports approximately 8,200 manned and 630 unmanned flights per year (**Daugherty, 2016**). All airspace outside the U.S. territorial limit is located in international airspace. Because the offshore airspace is in international airspace, the procedures outlined in International Civil Aviation Organization Document 444, *Rules of the Air and Air Traffic Services* are followed. The FAA acts as the U.S. agent for aeronautical information to the International Civil Aviation Organization and air traffic in the overwater areas is managed by the Washington ARTCC.

3.2.2 Environmental Consequences

This airspace analysis considers the potential impacts to general and civil aviation from proposals presented under the Proposed Action. Impacts on air traffic are considered with respect to the potential for disruption of air transportation patterns and systems and changes in existing levels of airspace safety. Impacts to air traffic might occur if an action has potential to result in an increase in the number of flights that could be accommodated within established operational procedures and flight patterns; requires airspace modification; or results in an increase in air traffic that might increase collision potential between military and non-participating civilian/general flight operations.

The primary purpose of the proposed expansion of R-6604 (i.e., R-6604C/D/E) would be to safely segregate civilian air traffic from the flight testing of unproven and experimental aerial systems, including unmanned and launched vehicle systems. NASA's expanding space program may also conduct experimental flight activities from the WFF airfield including horizontal launch vehicle takeoff, expendable launch vehicle (ELV) operations, and emergency Return to Base for horizontal launched vehicles. Additionally, through partnerships with the DOD, operational and developmental test and evaluation of military aircraft are performed from WFF. These tests routinely require assessment of aircraft stability and control while remaining in close proximity to the airfield.

3.2.2.1 No Action Alternative

Under the No Action Alternative, WFF would conduct operational missions and activities that are within the installation's current envelope. All operational missions and activities under the No Action Alternative have been covered by previous NEPA documents that are incorporated by reference into this EA. Both military and non-military entities have been sharing the use of the airspace that encompasses R-6604A/B and VACAPES for more than 30 years. Military, commercial, and general aviation activities have established an operational co-existence consistent with federal, state, and local plans and policies and compatible with each interest's varying objectives. The No Action Alternative includes training and testing operations that are, and have been, routinely conducted in the area for decades; however, as WFF continues the testing of unproven and experimental aircraft systems, the risk to non-participating aircraft increases. Ongoing, continuing operations would continue to use R-6604A/B and offshore W-386. Although the nature and intensity of use varies over time and by an individual area, the continuing training operations represent precisely the kinds of operations for which these areas were created (i.e., those that present a hazard to other aircraft).

Through close coordination FAA, WFF, and FACSFAC VACAPES ensure that hazardous activities are carefully scheduled to avoid conflicts with civilian activities and that safety standards are maintained while allowing the maximum amount of civilian access to overland and overwater airspace. Conditions under which general aviators or civilian pilots would need to request permission to enter R-6604A/B or W-386 when active would remain unchanged. Flight monitoring at WFF ATC, WFF Range Control Center, Washington ARTCC, and FACSFAC VACAPES would continue. NOTAMs and NOTMARs for broadcast by the FAA and USCG, when needed for operations in R-6604A/B and W-386, would also remain unchanged. As such, implementation of the No Action Alternative would have no impact on airspace management resources in R-6604A/B or W-386 but would pose a continuing safety risk to non-participating aircraft.

3.2.2.2 Proposed Action

No significant impacts to airspace management in the WFF or VACAPES OPAREA are anticipated with implementation of the Proposed Action. High-risk operations already occur within R-6604A/B; however, the current airspace configuration neglects a critical portion of the airspace over the Main Base runways that is required to safely conduct operations. NASA and its partners' aircraft are currently operating in the airspace proposed for expansion but the risks associated with experimental flight testing at WFF can neither be mitigated by the existing Restricted Area Airspace nor contained within the Class D airspace surrounding the WFF airfield. Therefore, this expansion is considered a risk mitigation measure that would help protect general and civilian aviation from unavoidable hazards associated with experimental flight tests. This proposal would formally designate the operating airspace as restricted; thereby, permitting NASA to close the airspace to non-participating aircraft, when in use.

The proposed lateral boundaries of R-6604C/D/E were calculated using the minimum VFR, cloud clearances, and terminal area performance of the typical unproven and experimental aircraft profiles to be flown. The floor and ceiling altitudes represent the minimums required to accomplish the necessary test maneuvers associated with the flight events. Linked to R-6604A/B, and extending through the WFF Main Base Class D airspace, the expansion of R-6604 would fully cover the WFF airfield and would encompass the airspace in which high-risk operations originating from the airfield are currently conducted. Additionally, establishment of R-6604C/D/E would provide an added safety buffer when existing and proposed high-risk operations occur at the launch range. NASA would activate only that portion of the Restricted Area Airspace that would be required for a specific flight profile and relinquish the remaining Restricted Area Airspace to the NAS.

Airport operations at the Accomack County Airport would not be impacted by the R-6604 expansion; the airport is approximately 16.7 km (9 nm) off the southwestern edge of the proposed R-6604E and would be outside the FAA required 5.5 km (3 nm) airport exclusion zone. The area navigation/global positioning system (GPS) approach path for Accomack County Airport Runway 21 would run down the western edge of R-6604D/E, northeast of the airport, and would not be impacted by activation of R-6604D/E.

The final proposed geometry of R-6604D was reduced so as not to impact the VOR/DME-A radio navigation station for IFR approach along V-139 to Crisfield Municipal Airport and the instrument landing system Runway 32 at Salisbury-Ocean City Regional Airport. Both systems use the Snow Hill navigational aid for an initial approach fix at 610 m (2,000 ft) along V-139, which would also coincide with the new proposed western edge of R-6604D/E (**Figure 3-2**). Additionally, aircraft operating under VFR in visual meteorological conditions are not required to use the navigational aid or the 610 m (2,000 ft) flight path along V-139. Because of the experimental nature of the WFF proposed aircraft test and evaluation activities, R-6604D/E would only be activated during visual meteorological conditions. Therefore, IFR approaches along V-139 would not be impacted.

While the proposed R-6604C/D/E encompasses a larger restricted area for general and civilian aviation, the proposed airspace modifications would not significantly change the existing relationship of the WFF's SUA with regard to V-139 operations. The ARTCC or ATC would route VFR air traffic above the 1,065 m (3,500 ft) ceiling or away from sections of NASA Restricted Area Airspace when active, providing separation from all military/NASA operations. Aircraft operating under VFR at private airfields or public airports adjacent to WFF airspace would be required to remain clear of those sections of the Restricted Area Airspace during "hot" or active periods or above/underneath the ceiling/floor of the proposed R-6604C/D/E airspace. Three private airstrips (Taylor, Midway, and Crippen Creek Farm) underlie the proposed R-6604E (**Figure 3-2**); however, for operations from either airstrip, aircraft could operate under the approximately 215 m (700 ft) AGL floor when the airspace is activated. Accordingly, no significant adverse impacts on flight operations in and around these airstrips would be anticipated.

No impact from military aircraft traversing VR1712 would be anticipated as operations through the airspace would be coordinated with the ARTCC or ATC. There is no overall mechanism to inform military or civilian aviators that an SR is active; however, as the floor of the proposed R-6604E would be above the ceiling of SR812, no impacts would be expected.

Restricted Area Airspace would be activated individually as needed, during visual meteorological conditions. **Table 2-1** forecasts the predicted usage of each airspace ranging from and average of approximately 60 hours per year for R-6604E, to 180 hours per year for each of R-6604C/D, 2,642 hours per year for R-6604B, and 3,320 hours per year each for R-6604A. Activation of the restricted area airspaces would occur by WFF via NOTAMs issued at least 12 hours prior to the activation. FAA would create additional waypoints necessary to assist pilots unfamiliar with the area to navigate safely around the newly expanded Restricted Area Airspace. Additionally, FAA would document the new Restricted Area Airspace on all applicable instrument approach procedures, IFR low-charts, and VFR sectionals. Therefore, navigational aid impacts at Snow Hill, Maryland for the Salisbury, Maryland airport would be minor and intermittent.

3.3 Health and Safety

3.3.1 Affected Environment

3.3.1.1 Ground Safety

Day-to-day institutional and operations activities conducted at WFF are performed in accordance with applicable NASA institutional safety and mission assurance programs and controls. Ground safety encompasses procedures and restrictions associated with hazardous systems during storage, handling, and preflight so that mission operations can be performed in a reasonable manner without undue risk to people or property. The Ground Safety Branch of the WFF Safety Office develops, plans, and promotes occupational health and safety, emergency planning, and response operations. Safety controls are established to minimize the potential hazards associated with workplace activities.

For WFF missions, the WFF Safety Office is responsible for the application of safety policies, principles, and techniques to assure the safety and integrity of the public, workforce, and infrastructure. The WFF Safety Office has the responsibility to ensure safe mission activities from preparation through operation and post-operations, both for missions launched from the WFF Range and those supported off range. NASA has established mission specific ground safety guidelines in NASA Procedural Requirements (NPR 7900.3C), Aircraft Operations Management Manual. These guidelines outline ground safety requirements, airfield user and tenant/partner responsibilities, and safety data requirements to which all aircraft operators at WFF must comply. In addition, WFF requires all airfield users to submit formal documentation pertaining to their proposed operations for safety review. Project and Program Safety Plans are prepared by WFF's Ground Safety Branch and address all potential ground hazards related to a given mission in accordance with NPR 7900.3C. The Ground Safety Plans outline controls for minimizing risks to

human health through the detection and elimination of hazards, safety awareness training, and enforcement of high standards of conduct and performance.

3.3.1.2 Flight Safety

In addition to complying with all applicable FAA aviation safety guidance, WFF has an established Aviation Safety Program that must be followed during all piloted aircraft and UAS operations. Defined in NPR 7900.3C, the program is overseen by an Aviation Safety Council and coordinated by an on-site Aviation Safety Officer (ASO). Key program elements include aircraft safety training, education, and awareness; hazard and mishap reporting and investigation; and airworthiness reviews prior to changes in aircraft design or configuration. The ASO ensures that risk assessment and hazard-analysis procedures are established that address risks, hazards, and mitigation methods associated with all aircraft modifications and research flights. Under the ASO, WFF maintains an Aircraft/Airfield Pre-Mishap Plan that assigns responsibilities, provides for alternative plans, ensures optimum use of available and backup resources, and is rehearsed annually. The Pre-Mishap Plan includes: annual fire/crash/rescue personnel briefing on aircraft regularly operated at WFF as well as specific briefings prior to the operation of any newly acquired aircraft, on rescue and emergency procedures peculiar to the aircraft; requirements for mock mishap drills that are evaluated by ASO to ensure optimal coordination with pre-mishap plans; procedures for aircraft mishaps away from the WFF airfield; and processes for notifying and working with the National Transportation Safety Board and the FAA for aircraft accidents reportable under Federal regulations.

Another important component of aviation safety at WFF is the ongoing wildlife hazard management program, sometimes referred to as the Bird/Wildlife Aircraft Safety Hazard (BASH) program. Performed on NASA's behalf by the USDA, Animal and Plant Health Inspection Service's Wildlife Services Division, the purpose of the program is to mitigate both short- and long-term hazards to aviation. Since the development of WFF's Wildlife Hazard Management Plan in 2001, USDA has maintained a full-time presence at WFF to disperse and remove birds and mammals from the airfield. BASH program objectives include reducing the attractiveness of WFF to birds and wildlife by minimizing food sources, nesting sites, and roosting habitat within the airfield clear zones. USDA personnel regularly implement various management techniques within and adjacent to the WFF airfield, which can include: identifying and manipulating species habitat and roosts, employing techniques to disperse species, and, if deemed necessary, removal of birds and/or mammals that pose a hazard to human health and aviation safety under appropriate Federal and state permits.

3.3.2 Environmental Consequences

3.3.2.1 No Action Alternative

Under the No Action Alternative, operational missions and activities would remain at current levels within documented envelopes. Conditions under which general aviators or civilian pilots

would need to request permission to enter R-6604A/B or W-386 when active would remain unchanged. Flight monitoring at WFF ATC, WFF Range Control Center, Washington ARTCC, and FACSFAC VACAPES would continue. NOTAMs and NOTMARs for broadcast by the FAA and USCG (respectively), when needed for operations in R-6604A/B and W-386, would also remain unchanged. However, at-will entrance of civil aircraft into the unrestricted airspace over and around the WFF airfield, creates a hazard to test aircraft and personnel, general aviation aircraft and operators, the public, and civil and government infrastructure on the ground. Risks are posed from pilots performing high-speed tower fly-bys for pitot-static calibration; flight of unproven, experimental, or highly modified aircraft; pilot training, or in-air testing of various in-flight systems and sensors that. As such, implementation of the No Action Alternative would pose a greater safety risk to government and civilian pilots, the public, and infrastructure.

3.3.2.2 Proposed Action

Presently, the majority of high-risk test profiles and pilot training conducted at WFF are only partially contained within established Restricted Area Airspace, R-6604A/B. These activities present a substantial hazard to civil air traffic in the vicinity of WFF. Test aircraft are often heavily modified to assess new systems. These modifications can restrict the pilot's ability to maneuver the aircraft. An unplanned, abrupt maneuver (possibly caused by intruding, non-participating air traffic) violates the "build-up" safety principal of flight test. Such an event could exceed a design limit load, place the aircraft in untested/unproven energy state (e.g., structural stress), and endanger both the test aircrew/aircraft as well as non-participating (e.g., civil) air traffic. The limited maneuverability of aircraft used to implement tests during flight assessments presents an unusual hazard to non-participating aircraft, and inherently increases the risk of a midair collision when tests are conducted in co-use airspace. Additionally, NASA performs systems and sensor testing such as laser firings involving calibrations of equipment that could cause severe or permanent eye damage if a non-participating aircraft accidentally intrudes within the safe hazard distance of such tests.

Expansion of the Restricted Area Airspace would protect non-participating aircraft from the dangers associated with high-risk experimental test flight operations. According to the FAA Air Traffic Order JO 7400.8X, Special Use Airspace, dated February 10, 2015, aircraft cannot be operated within a restricted area without the advance permission of the using agency or controlling agency. If R-6604 is expanded, aircraft would not be prohibited from flying within the airspace but their use of the airspace would be restricted when the airspace is "hot" to ensure the safety of all aircraft during operational missions and activities. Expanding the existing airspace would safely segregate non-participating, civilian air traffic from the flight testing of unproven and experimental aerial systems, including unmanned and launched vehicle systems, as well as pilot training. Expanding the Restricted Area Airspace in a segmented fashion, would facilitate safe separation between the participating and non-participating aircraft in a minimally interfering approach to current civil air traffic; therefore the Proposed Action would result in a beneficial impact to safety.

3.4 General/Civil Aviation

3.4.1 Affected Environment

As shown in **Table 3-2**, approximately 25,300 FAA certified pilots are registered in the District of Columbia, Delaware, Maryland, Virginia portion of the Eastern region (**AOPA, 2016**). Of these certified pilots, approximately 14,000 form the local General (or civil) Aviation community (i.e., students, private, recreational, and sports certified pilots). Locally, general aviation pilots travel north and south along the Delmarva Peninsula following either the Atlantic coastline, Airway V-1, or Airway V-139. Between March 1, 2015, and March 1, 2016, the air traffic in the survey area determined by the four coordinate points shown in **Figure 3-3** and flying below an altitude of approximately 915 m (3,000 ft) MSL averaged 18 VFR flights and 14 IFR flights per day for a total of approximately 32 flights per day (**FAA, 2016a**). According to the FAA, most general aviation traffic on V-139 occurs at altitudes between approximately 3,050 and 4,000 m (10,000 and 13,000 ft) MSL (**FAA, 2012**).

Table 3-2. FAA Certified Pilots by Certification Type

State	Total	Students	Private	Recreation	Sport
Virginia	15,038	2,902	4,925	10	77
Maryland	8,256	1,952	2,943	4	56
Delaware	1,439	306	470	0	14
District of Columbia	566	141	248	0	7
Total	25,299	5,301	8,586	14	154

Additionally, out of the 340 registered civil/private airfields in Virginia (**AOPA, 2016**), three airstrips, Taylor Airport (FAA ID 4VA6), Midway Airport (FAA ID VG56), and Crippen Creek Farm Airport (FAA ID 9VA3), underlie the proposed R-6604E airspace.

3.4.2 Environmental Consequences

3.4.2.1 No Action Alternative

Under the No Action Alternative, WFF would conduct operational missions and activities that are within the installation's current envelope. Impacts from all operational missions and activities under the No Action Alternative, including those to general aviation, have been covered by previous NEPA documents that are incorporated by reference into this EA. Both military and civilian entities have been sharing the use of the airspace that encompasses R-6604A/B and VACAPES for more than 30 years. Military, commercial, and general aviation activities have established an operational co-existence consistent with federal, state, and local plans and policies and compatible with each interest's varying objectives. The No Action Alternative includes training and testing operations that are, and have been, routinely conducted in the area for decades; however, as WFF continues the testing of unproven and experimental aircraft systems, the risk to non-participating aircraft increases. Ongoing, continuing operations would continue to use

R-6604A/B and offshore W-386 and would continue to overfly the NAS and V-139. Although the nature and intensity of use varies over time and by an individual area, the continuing training operations represent precisely the kinds of operations for which these areas were created (i.e., those that present a hazard to other aircraft).

Conditions under which general aviators or civilian pilots would need to request permission to enter R-6604A/B or W-386 when active, would remain unchanged. Flight monitoring at WFF ATC, WFF Range Control Center, Washington ARTCC, and FACSAC VACAPES would continue. NOTAMs and NOTMARs for broadcast by the FAA and USCG (respectively), when needed for operations in R-6604A/B and W-386, would also remain unchanged. However, there would remain a risk from pilots performing high-speed tower fly-bys for pitot-static calibration; flight of unproven, experimental, or highly modified aircraft; pilot training, or in-air testing of various in-flight systems and sensors that creates a hazard to test aircraft and personnel, general aviation aircraft and operators, the public, and civil and government infrastructure on the ground. As such, implementation of the No Action Alternative would pose a greater hazard to general aviation.

3.4.2.2 Proposed Action

Under the Proposed Action, the Restricted Area Airspace would be divided into three smaller blocks such that only the airspace needed for testing would be activated at any given time. Activation of either of the R-6604A/B/C/D/E areas would be accomplished by issuing a NOTAM at least 12 hours prior to the activation. The ARTCC or ATC would route VFR air traffic above the 1,065 m (3,500 ft) ceiling of the proposed R-6604C/D/E airspace, underneath the 30 m (100 ft) floor of R-6604D or the 213 m (700 ft) floor of R-6604E, or away from sections of NASA Restricted Area Airspace when “hot” or active; thereby, safely providing separation between general aviation and hazardous operations.

It is important to note that the existing WFF Class D airspace extends to 760 m (2,500 ft) AGL and that VFR aircraft transiting north or southbound along the coast currently fly over this ceiling versus circumnavigating the area. With the ceiling for all airspace areas of the R-6604 expansion proposed at 1,065 m (3,500 ft), the difference in minimum flight altitude would rise by only 305 m (1,000 ft). Moreover, most pilots currently fly V-139 at altitudes between approximately 3,050 and 4,000 m (10,000 and 13,000 ft) MSL (FAA, 2012). Therefore, the impact to the general aviation community would be minimal.

As shown in **Figure 3-2**, all three local airstrips would be underneath R-6604E. When the airspace is activated, aircraft operating from either of these three airfields could still fly under the approximately 215 m (700 ft) AGL floor. **Table 2-1**, details the anticipated usage of each section of the proposed expansion and describes R-6604E as potentially active 1.5 hours per day over 40 days per year for a total of approximately 60 hours per year. Additionally, R-6604D would potentially be activated 1.5 hours per day over 120 days totaling 180 hours per year. Accordingly, no significant adverse impacts on flight operations from these airstrips would be anticipated.

3.5 Noise

Sound, expressed in decibels (dB), is created by vibrations travelling through a medium such as air or water. A-weighting (dBA) provides a good approximation of the response of the average human ear and correlates well with the average person's judgment of the relative loudness of a noise event. **Table 3-3** provides typical noise levels. A sound level of 0 dBA is the approximate threshold of human hearing and is barely audible under extremely quiet conditions. By contrast, normal speech has a sound level of approximately 60 dBA. Sound levels above 100 dBA begin to be felt inside the human ear as discomfort. Sound levels between 110 and 130 dBA are felt as pain; levels exceeding 140 dBA could involve tissue damage to the ear (**Berglund and Lindvall, 1995**). The minimum change in the sound level of individual noise events that an average human ear can detect is about 3 dB. On average, a person perceives a doubling (or halving) of a sound's loudness when there is a 10 dB change in sound level.

Table 3-3: Typical Noise Levels of Familiar Noise Sources and Public Responses

Thresholds/Noise Sources	Sound Level (dBA)	Subjective Evaluation ^a	Possible Effects on Humans ^a
Human threshold of pain	140	Deafening	Continuous exposure to levels above 70 dBA can cause hearing loss in the majority of the population
Siren at 30 m (100 ft)	130		
Jet takeoff at 61 m (200 ft) Auto horn at 1 m (3 ft)	120		
Chain saw or noisy snowmobile	110		
Lawn mower at 1 m (3 ft) Noisy motorcycle at 15 m (50 ft)	100	Very Loud	
Heavy truck at 15 m (50 ft)	90		
Pneumatic drill at 15 m (50 ft) Busy urban street, daytime	80	Loud	Speech interference
Normal automobile at 80 km per hour (50 mi per hour)	70		
Vacuum cleaner at 1 m (3 ft)			
Thresholds/Noise Sources	Sound Level (dBA)	Subjective Evaluation ^a	Possible Effects on Humans ^a
Air conditioning unit at 6 m (20 ft) Conversation at 1 m (3 ft)	60	Moderate	Speech interference
Quiet residential area Light auto traffic at 30 m (100 ft)	50		Sleep interference
Library or quiet home	40	Faint	None
Soft whisper at 5 m (15 ft)	30		
Slight rustling of leaves	20	Very Faint	
Broadcasting studio	10		
Threshold of Human Hearing	0		

Note: ^aBoth the subjective evaluations and the physiological responses are continuums without true threshold boundaries.

Consequently, there are overlaps among categories of response that depend on the sensitivity of the noise receivers.

Source: EPA, 1974.

3.5.1 Noise Metrics

Noise is often defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Noise may be intermittent or continuous, steady or impulsive, and may be generated by stationary or mobile sources. The individual response to similar noise events can vary widely and is influenced by the type and characteristics of the noise source, distance between source and receptor, receptor sensitivity, and time of day. The impact of noise is described through the use of noise metrics which depend on the nature of the event and who or what is affected by the sound.

3.5.1.1 Airborne Noise

Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use A-weighting which provides a good approximation of the response of the average human ear and correlates well with the average person's judgment of the relative loudness of a noise event. Airborne noise is represented by a variety of metrics that are used to quantify the noise environment. Maximum dBA metrics (also shown as dB L_{Amax}) represent the maximum A-weighted sound level over a duration of an event such as an aircraft overflight. "Unweighted" (dB or dB L_{max}) metrics represent low frequency sound levels used to analyze structural response to noise. The metric correlates with low frequency noise. A-weighted Sound Exposure Level (SEL) represents both the magnitude of a sound and its duration. SEL is greater than the dB L_{max} because an individual event (i.e., aircraft landing) can take several minutes while the dB L_{max} occurs instantaneously. The Day Night Average Sound Level (DNL) is a cumulative noise metric that accounts for all noise events over an average 24-hour period. This is often shown as dB DNL. DNL is used to predict human annoyance and community reaction to noise.

3.5.1.2 Sonic Booms

A sonic boom is created when an object (e.g., jet aircraft) travels faster than the speed of sound. A sonic boom differs from other sounds in that it is impulsive and very brief, lasting less than one second. Shock waves, or sound overpressures, associated with sonic booms (boom load) have the potential to cause structural damage. Most damage claims from sonic booms are for brittle objects such as glass and plaster. There is a large degree of variability in damage experience, and the degree of damage depends on the pre-existing condition of an object or structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 7 kiloPascals (kPa) (1 pound per square foot [psf]), the probability of a window breaking ranges from one in a billion (**Sutherland, 1990**) to one in a million (**Hershey and Higgins, 1976**). These damage rates are associated with a combination of boom load and glass condition. At 70 kPa (10 psf), the probability of breakage is between one in a 100 and one in a 1,000 (**Haber and Nakaki, 1989**). Laboratory tests of glass have shown that properly installed window glass will not break at overpressures below 70 kPa (10 psf), even when subjected to repeated booms (**White, 1972**). Because a sonic boom is not generated until the aircraft reaches supersonic speeds, the airfield site itself (e.g., runways) does not experience a sonic boom. Rather, the boom occurs

downrange of the airfield, along the flight path of the aircraft. For flight operations from WFF, sonic booms would only occur in the Warning Areas over the Atlantic Ocean.

3.5.2 Regulatory Context

Noise in the U.S. is regulated under a number of different statutes and regulations. The Noise Control Act of 1972 as amended by the Quiet Communities Act of 1978, set forth the policy of the U.S. to promote an environment for all citizens that is free from noise that jeopardizes human health and welfare. Specific noise regulations can be imposed by Federal agencies and state and local governments. Thresholds and guidelines for airborne noise applicable to aircraft activities at WFF along with standard thresholds are provided below.

3.5.2.1 Accomack County Noise Ordinance

The Accomack County Code provides noise threshold guidelines based on the different zoning districts within the county. The Code provides noise levels for both day and nighttime activities, and activities that will exceed these thresholds are generally prohibited. Article 38-35 of the Code states that the thresholds shown in **Table 3-4** do not apply to commercial or industrial operations except if noise from those operations emanates beyond the boundaries of the commercial or industrial site and affect persons who are not working onsite (**Accomack County, 2001**). No specific noise thresholds have been established for any sensitive receptors but the Code states that noise would be deemed excessive if it “unreasonably interferes with the workings of such institution or building, provided that conspicuous signs are displayed on or near such building or institution indicating that such is a school, church, hospital, clinic, or other public building” (**Accomack County, 2001**).

Table 3-4: Accomack County Noise Guidelines by Land Use

Zoning District	Daytime Level (dBA)	Nighttime Level (dBA)
Residential	65	55
Agricultural	65	55
Business	70	60
Industrial	70	60
Barrier Island	65	55

Source: Accomack County, 2001.

3.5.2.2 Federal Interagency Committee on Urban Noise

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise (FICUN) published guidelines relating DNL to compatible land uses (**FICUN, 1980**). This committee was composed of representatives from DOD, DOT, Department of Housing and Urban Development, EPA, and Veterans Administration. Since their issuance, Federal agencies have generally adopted these guidelines for their noise analyses. According to a study conducted by FICUN, noise levels between 65 and 70 dB DNL are compatible with educational services, such as schools, provided that measures are taken to provide noise level reduction of 25 dB in the buildings (**FICUN, 1980**).

3.5.2.3 Federal Aviation Administration Significant Impact Threshold for Noise

FAA actions are subject to FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* which states that special consideration needs to be given to the evaluation of the significance of noise impacts on noise sensitive areas, including wildlife refuges. A noise sensitive area is defined by the FAA as an area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites. FAA Order 1050.1F adds guidance that gives special consideration to the evaluation of the significance of noise impacts on noise-sensitive areas within national parks, national wildlife refuges, and historic sites including traditional cultural properties. As defined by the FAA Order 1050.1F, a significant noise impact would occur if the Proposed Action would cause noise-sensitive areas to experience an increase of 1.5 dB DNL or more at or above 65 dB DNL when compared to the No Action Alternative for the same timeframe.

3.5.2.4 OSHA Noise Guidance

The Occupational Safety and Health Act (OSHA) of 1970 assures safe and healthy working conditions by enforcing standards and by providing training, education, outreach, and assistance. OSHA regulates noise impacts to workers, and establishes thresholds for a safe work environment. OSHA standards (29 CFR 1910.95) are the most well documented requirements in regards to long-term human noise exposure. OSHA standard provides noise exposure limits for employees in noisy environments or workplaces. According to OSHA, an employee should not be subjected to continuous noise exceeding 90 dBA for durations lasting more than 8 hours per day (**Table 3-5**). As the level increases, the allowed duration of exposure decreases. The maximum limit is 115 dBA for duration of 15 minutes or less.

Table 3-5: OSHA Permissible Noise Exposures

Duration per Day (hours)	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115
Source: OSHA, 2012.	

3.5.3 Affected Environment

Noise is generated on the WFF Main Base by three main sources: vehicles, equipment used during construction and demolition activities, and aircraft. Vehicular traffic and construction related activities at WFF are considered minor sources of noise. Typically, noise from vehicle operations range from 50 dBA (for light traffic) to 80 dBA for diesel trucks. Construction noise varies greatly depending on the construction process, type and condition of equipment used, and the layout of the construction site. Overall, construction noise levels are governed primarily by the noisiest pieces of equipment (e.g., dump truck, excavator, and grader). Airfield operations account for the majority of noise generated at the Main Base.

The baseline airfield operation level for WFF of 12,843 was established in 2004 using annual airfield operations data for that year with an envelope that included a 25 percent increase above that total (**NASA, 2005**). In 2013, WFF's baseline airfield operation level was increased to include an additional 45,000 annual U.S. Navy E-2/C-2 FCLP operations, for a maximum of approximately 61,000 annual airfield operations at WFF (**USN, 2013**).

During the development of the EA for the FCLP program, the Navy had revised airfield noise contours produced for WFF (**BBRC, 2012**). NOISEMAP[®] was used to model noise from fixed-wing aircraft. The study area for noise at WFF Main Base consisted of the area within the modeled 65 dB and greater DNL noise zone. The breakdown of annual operations at WFF Main Base used during the development of the noise contours, are listed in **Table 3-6**. Aircraft listed are the most frequent and/or loudest aircraft using the WFF Main Base, and their operation defines the noise contours at the airfield. All existing operations were modeled as acoustic day operations, as normal operating hours for the airfield are from 7 a.m. to 5 p.m. The model was based on the following existing runway utilization: 65 percent of the total operations on Runway 10-28 (with 40 percent of those on Runway 10 and 60 percent on Runway 28) and 35 percent of total operations on Runway 04-22 (with 30 percent on Runway 04 and 70 percent on Runway 22). Therefore, using the percentages noted by individual runway, the composite runway utilization modeled for the four runways was 11 percent for Runway 04, 24 percent for Runway 22, 26 percent for Runway 10, and 39 percent for Runway 28 (**BBRC, 2012**). Because the number of rotary-wing aircraft operating at WFF Main Base is minimal and did not increase the size of existing noise contours, the Rotorcraft Noise Model was not used.

Table 3-6: Typical Annual Aircraft Operations for Wallops Flight Facility Main Base

	Departures	Arrivals	Patterns	Total
Civilian Aircraft				
NASA	157	157	-	314
Misc.	94	94	-	188
Subtotal Civilian Operations				502
Military Aircraft				
U.S. Navy	789	789	9,471	11,049
U.S. Navy E-2/C-2	703	703	43,594	45,000
Maryland Air National Guard	55	55	662	772
U.S. Air Force	48	48	574	670
Army and Coast Guard	41	41	-	82
Subtotal Military Operations				57,573
Total				58,075

Source: **BBRC, 2012**

The existing noise contours modeled for WFF Main Base are entirely located in Accomack County, Virginia (see **Figure 3-4**). The existing noise zone that is 65 dB DNL or greater covers approximately 352 hectares (800 acres) outside of the WFF Main Base property boundary.

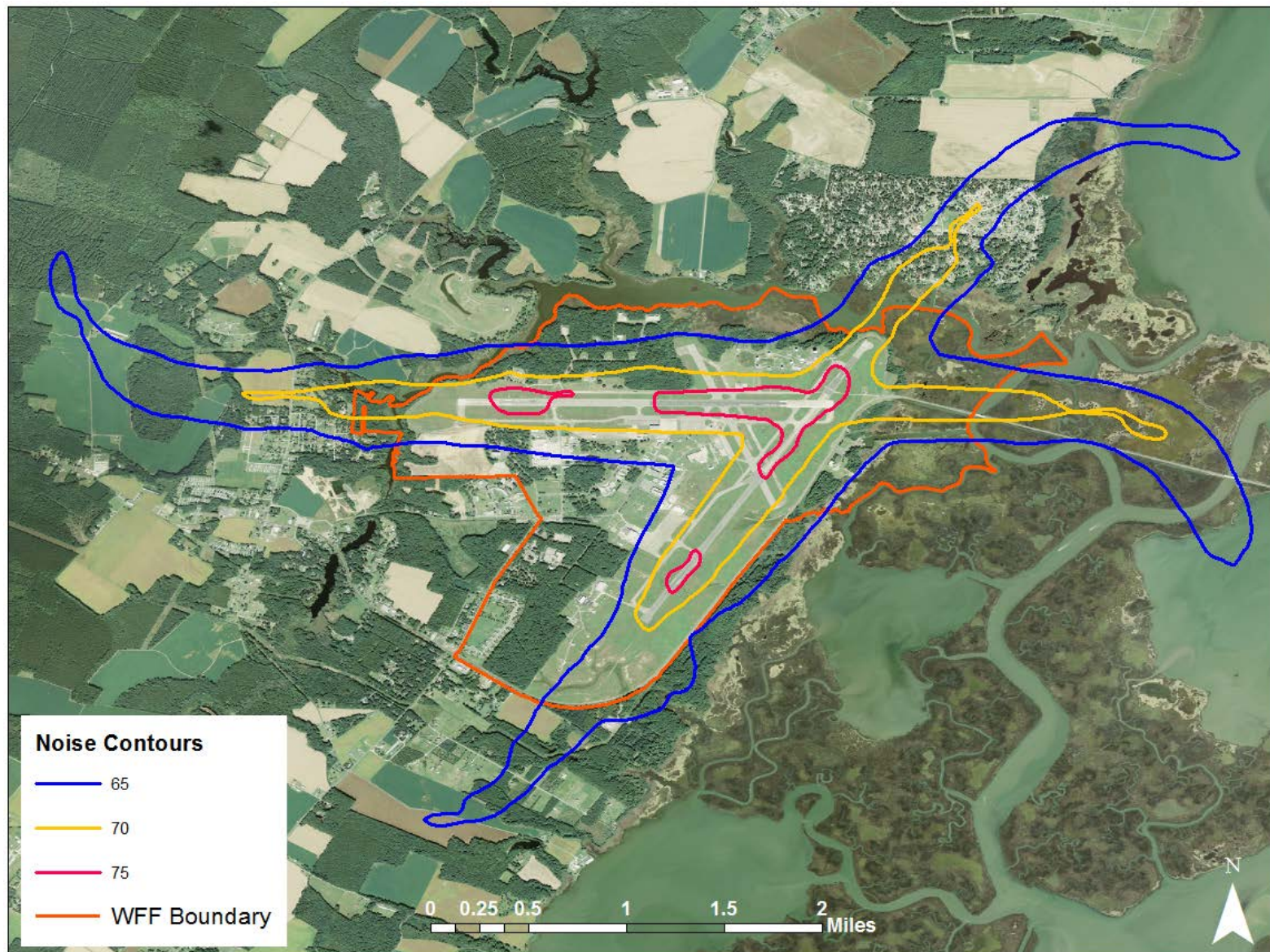


Figure 3-4: Baseline Noise Contours around the WFF Main Base Airfield

Aircraft operations generate the greatest noise levels around the Main Base. According to the WFF Public Affairs Office and Navy's Region Mid Atlantic, between November 2013 and February 2016, a total of 124 noise complaint calls were received from 39 callers with 62 of these complaint calls originating from five callers; 20 of the 39 callers and 84 of the 124 noise complaint calls were from residential areas within 0.75 nautical miles west of the approach end of Runway 10. All complaints focused on FCLP operations. The majority of calls were received by the hotline that the Navy established solely for the purpose of WFF FCLP complaint calls. The Navy has directly contacted all callers to further discuss the caller's concerns (NASA, 2016).

3.5.1 Environmental Consequences

3.5.1.1 No Action Alternative

Aviation and typical community noise levels near airports are not comparable to the occupational or recreational noise exposures associated with hearing loss (Wyle, 2012). Studies of aircraft noise levels associated with civilian airport activity have not definitively correlated permanent hearing impairment with aircraft activity (Newman and Beattie, 1985; von Gierke and Eldred, 1993). A 2009 DOD policy directive requires that hearing loss risk be estimated for military installations for the at-risk population, defined as the population exposed to DNL greater than or equal to 80 dB and higher (DOD, 2009). The noise generated by aircraft operations at WFF does not reach 80 dB DNL, even on-base. There would not be a significant risk for potential loss of hearing associated with expanding R-6604 at the WFF Main Base.

3.5.1.1 Proposed Action

Under the Proposed Action, NASA does not propose to change existing aircraft operation levels or aircraft types; therefore, no change in noise levels is anticipated from the existing to the projected environment on or around the WFF Main Base, including that of residential areas, the Wallops National Wildlife Refuge, or the Assateague Island National Seashore. No other sensitive receptors (e.g., educational, health, and religious or cultural structures and sites) are within the current 65 dB DNL or greater noise contour surrounding the WFF airfield. Noise levels from general aviation may be slightly lower at the ground surface as these aircraft would travel along V-139 at a slightly higher MEA near WFF, i.e., 1,065 m (3,500 ft) versus 760 m (2,500 feet). Therefore, there would be no significant impact from noise as a result of expanding R-6604.

4 Cumulative Effects

The CEQ regulations for implementing NEPA define cumulative effects as the “impact on the environment which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR § 1508.7). Cumulative effects are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with, or in close proximity to, the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time would tend to offer a higher potential for cumulative effects.

Following CEQ’s 1997 guidance (**CEQ, 1997**), the scope of the Cumulative Effects Analysis (CEA) should be related to the magnitude of the environmental impacts of the proposed action. Proposed actions of limited scope and impact typically do not require as comprehensive a CEA as proposed actions that have environmental impacts over a large area. Therefore, similar to the methodology employed for deciding those resources to be considered in detail in the “affected environment” sections of this EA, only those resource areas where the Proposed Action may have incremental interactions with other actions which could potentially result in cumulative effects are considered below.

4.1 Present and Reasonably Foreseeable Actions

4.1.1 Wallops Research Park

The 2008 EA assessed the development of the Wallops Research Park (WRP) adjacent to the Main Base on approximately 202 acres (82 hectares) of lands owned by NASA, Accomack County, and the Chincoteague Bay Field Station. Although roads and utilities have been constructed in the WRP, no tenants have developed lands in the Park yet. Upon full build out, the research park will consist of a multi-use development dedicated to public recreational areas, educational facilities, and commercial and government space and science research (**NASA, 2008**).

4.1.2 Navy MQ-4C Triton UAS Home Basing

In order to enhance maritime intelligence, surveillance, and reconnaissance capabilities under the Navy’s Maritime Patrol and Reconnaissance Force in the Atlantic Fleet’s area of operations, the Navy proposes to establish a launch and recovery site for four home based MQ-4C Triton UAS and an operational-level maintenance hub for up to four additional aircraft undergoing maintenance actions. The WFF Main Base airfield and the adjacent WRP are two of four proposed alternative sites along the east coast that are under consideration by the Navy for this action.

4.2 Resource Analysis

The only resources that would be cumulatively affected, when considering the Proposed Action and the present and reasonably foreseeable actions could potentially be to public health and safety and general aviation. No other resources would be cumulatively impacted by these actions.

4.2.1 Public Health and Safety

Cumulatively, implementation of the Triton UAS home basing project, aircraft tenants in WRP that may need Restricted Area Airspace, and expansion of R-6604 would broaden the airspace usage that is under direct air traffic control for aircraft operations out of the WFF airfield. This would create better, safer separation between non-participating and participating operations, such as Triton UAS and potential WRP tenants with hazardous aircraft operations, originating from WFF. Expansion of the Restricted Area Airspace would benefit Triton UAS and potential WRP tenants operations by separating these entities from non-participating aircraft; thereby, avoiding possible in-flight mishaps and accidents. Prevention of in-air collisions or close-calls would increase the safety of ground-level public, employees, and infrastructure below these airspaces. Therefore, when these actions are considered cumulatively, there would be positive or beneficial impacts to public health and safety through mishaps or accident avoidance by implementing the Proposed Action.

4.2.2 General Aviation

Under the Proposed Action, the Restricted Area Airspace would be divided into three smaller blocks such that only the airspace needed for testing would be activated at any given time. Activation of either of the R-6604A/B/C/D/E areas if necessary for any action originating at the WFF airfield including Triton UAS and potential hazardous aircraft operating WRP tenants, would be accomplished by issuing a NOTAM at least 12 hours prior to the activation. During activation, standard air traffic management techniques would be employed. The airfield universal communications frequency would be monitored continuously during operations. In addition, during hours when the airfield is open, the air traffic control tower would monitor and direct non-participating aircraft, as necessary. The ARTCC or ATC would route VFR air traffic above the 1,065 m (3,500 ft) ceiling of the proposed R-6604C/D/E airspace, underneath the 30 m (100 ft) floor of R-6604D or the 213 m (700 ft) floor of R-6604E, or away from the activated sections of NASA Restricted Area Airspace.

The current and projected WFF annual baseline airfield operation (i.e., takeoffs or landings) level is up to approximately 61,000 operations per year. In 2015, the annual airfield operations at WFF totaled 41,786 (**Ferrier, 2016**). The Navy projects that an average of five Triton flight operations would be conducted per day, or 1,825 annually. Aircraft operations from any new tenants to the WRP, when added to all other operations, would remain within this envelope.

Between October 2014 and September 2015, the WFF Test Director activated R-6604A/B 566 times for a total of 7,625 hours (**Dickerson, 2016**). Activation activities included rocket launches,

target drone operations, and UAS flights from Wallops Island. **Table 2-1**, details the anticipated usage of each section of the proposed expansion and describes R-6604E as potentially active 1.5 hours per day over 40 days per year for a total of approximately 60 hours per year. Additionally, R-6604D would potentially be activated 1.5 hours per day over 120 days totaling 180 hours per year.

Between March 1, 2015, and March 1, 2016, the air traffic in the survey area determined by the four coordinate points shown in **Figure 3-3** and flying below an altitude of approximately 915 m (3,000 ft) MSL, averaged 18 VFR flights and 14 IFR flights per day for a total of approximately 32 flights per day (**FAA, 2016a**). According to the FAA, most general aviation traffic on V-139 occurs at altitudes between approximately 3,050 and 4,000 m (10,000 and 13,000 ft) MSL (**FAA, 2012**). Given the low traffic volume and average high altitude flight path along Airway V-139 for general aviation, the low number of annual hours estimated for activation of any portion of R-6604A/B/C/D/E, and the measures put in place to minimize disruption to non-participating air traffic during WFF operations, when considered cumulatively, the impact to general aviation from the Proposed Action, existing WFF aircraft operations, Triton UAS, FLCP, and potential WRP tenants would be minimal.

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5 Other Considerations

5.1 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that once used for a project they cannot be used for other purposes. Human labor is also considered an irretrievable resource. Another impact that would fall under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment. This EA has determined that the alternatives considered would not result in irreversible or irretrievable commitments of resources.

5.2 Unavoidable Adverse Impacts

NEPA requires a description of any significant impacts resulting from implementation of a proposed action, including those that can be mitigated to a less than significant level. This EA has determined that neither the No Action Alternative nor the Proposed Action would result in any unavoidable adverse impacts.

5.3 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

As discussed in Chapter 3, environmental consequences for both the No Action Alternative and the Proposed Action, neither would expected to result in the types of impacts that would reduce environmental productivity, affect biodiversity, or narrow the range of potential long-term beneficial uses of the environment.

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